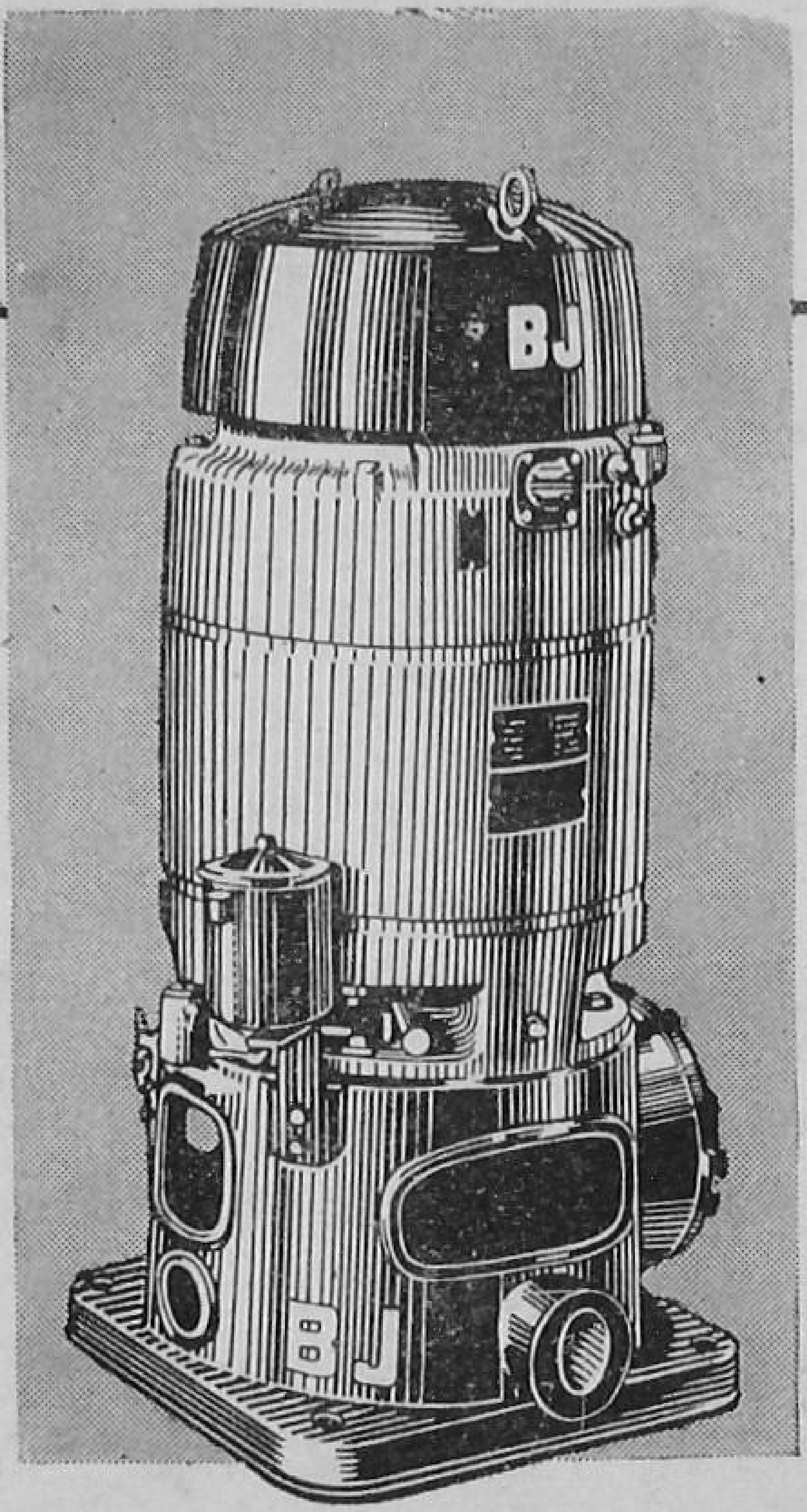
Indian Farming

AUGUST 1959

OFFICE OF THE PRINCIPAL
31 AUG 1959



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OUR COVER

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Indian Farming

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31 AUG 1959
TRAINING CENTRE

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Editor : **Harkirat Singh**

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FOREST ON FARM

ON forests, they say, depends the agriculture of a country. The forests on the hills conserve rain-water and ensure its steady supply all the year round to the fields in the plains through springs, streams, wells, etc. The forests on the plains protect the precious topsoil from which crops draw their sustenance. An optimum area under tree-cover is, therefore, an absolute necessity.

India's forest area, however, falls short of this optimum of $33\frac{1}{3}$ per cent by about 1.4 lakh square miles. Compared with countries like the U.S.S.R. and the U.S.A., with per capita forest areas of 3.5 and 1.8 hectares, respectively, we have only 0.2 hectares. Afforestation, accordingly, has been given its rightful place in the Second Five Year Plan in which Rs. 20 crores have been earmarked for the various forestry schemes aimed at making up the leeway.

While the governmental efforts would be mainly directed towards raising of new plantations on vulnerable places like the hill-slopes, catchment areas and river banks, rejuvenating degraded forests and maintaining the existing forests at a reasonable level of productivity, there is a way in which the farmer can supplement these efforts: by growing a woodlot on his own farm. By so doing, apart from rendering a signal service to the nation, he would be deriving quite a few benefits for himself too:

A farm woodland in the form of a wind-break is the best bulwark against soil erosion by wind. The consequent slowing down of the wind leads to less evaporation, moderation of temperature and increased humidity — all of which make for better harvests. Even a ten per cent reduction in wind velocity could mean a great deal. A yield increase of 40 per cent has been recorded in fields protected by trees in the Great Plains of America, as compared with unprotected ones.

In addition, the farmer can get pasture for his animals, small timber for his various needs and manure for the fields.

He can also depend on the farm woodlot for fuel, and need not burn the valuable cow-dung.

Where individual holdings are too small for woodland, farmers should not hesitate to pool their resources for the common good.

BACK-YARD GRAPES BRING 2,500 A YEAR

by

S. L. Katyal

HYDERABAD, they say, is a city where many homes grow grapevines in the back-yard, and make good money out of them. "Lakshmi-nivas," belonging to Shri Srinivas Reddy, is one such home, and it has fourteen vines which bring in a net profit of Rs. 2,500 a year !

"It was on the encouragement given by one of my friends, a retired horticulturist," said Reddy, "that I decided to utilize the 1,800 square feet of my house-compound for growing grapes. No doubt, it called for a good deal of hard work, but the experience has proved quite rewarding." Of course, being a novice, he had to take frequent advice from his horticulturist friend in the beginning.

First of all, Reddy dug 3 feet × 3 feet pits at a distance of ten feet from each other. He planted the *Anab-e-Shahi* variety. That was in January, 1953.

For the *pandal*, he fixed ten-feet long and eight to ten inches thick stone pillars about two feet deep into the ground. Over them, he built a framework of beams 12 to 13 feet long and about three to four inches thick, with a 1½-foot gap between two beams. In this way, a 1,400 square-foot *pandal* was ready for training the vines on.

He allowed only one main stem to grow and pruned off all the other shoots. In three months, the main stem grew about eight feet high, and at this height he left only two canes to spread on both sides of the *pandal*.

On these two canes, he retained shoots, with a distance of 1½ feet between them and tied them to the *pandal* framework with twine. These shoots later on gave out fruit-bearing side-shoots.

TWO PRUNINGS

He pruned the vines twice a year—once in April and then in October. In April, he pruned the previous year's side-shoot, leaving one bud on each. These side-shoots had grown well and were pruned back in October to four to five buds each. The vines started fruiting in the third year.

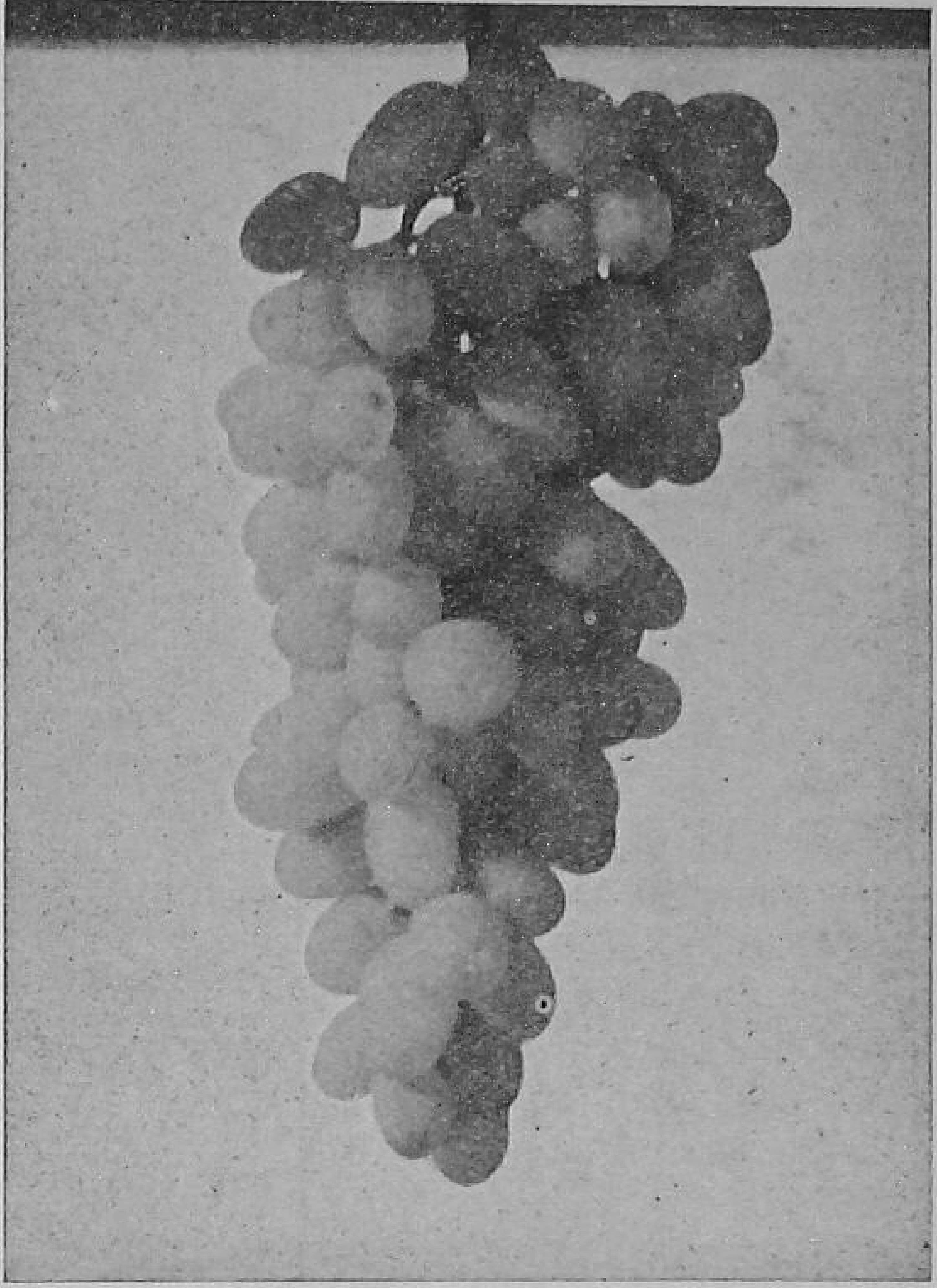
Experience has taught Reddy that manures mean a lot to grapevines. The vigorous growth of his vines showed that they received adequate manuring. On my asking, he told me that he manured them twice—after each pruning. He then gave me his schedule:

In October	10 lb.	"Steromeal"
	2 lb.	superphosphate
	1 lb.	potassium sulphate
	10	baskets of sheep-dung manure
In April	6 lb.	castor cake
	4 lb.	bonemeal
	1 lb.	ammonium sulphate
	10	baskets cow-dung manure

Immediately after manuring he gives an irrigation.

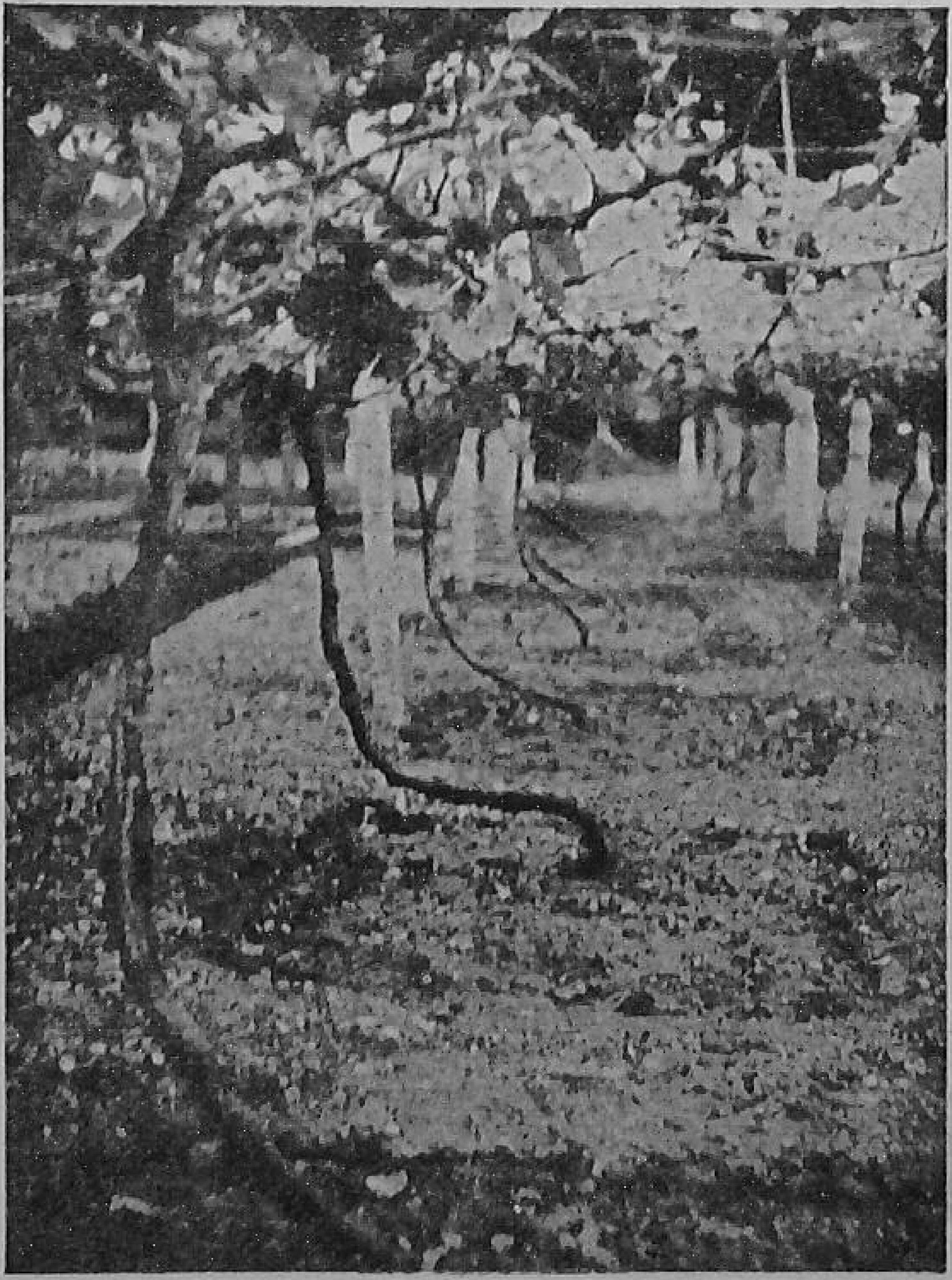
GOOD AFTER-CARE

Reddy also seemed to be well aware of the importance of irrigation for getting a good grape harvest. For irrigating his vines, he has provided a water tap in the vineyard itself. During summer, he gives two irrigations a week, and in winter, one irrigation a fortnight or so.



Reddy's harvest includes luscious bunches as this

Reddy's vineyard. Basins have been made for manuring the vines



To keep insects pests and diseases away, Reddy sprays his vines six times a year—in April, June, July, August, October and November, with Copper-"Sandoz" —an ounce in three gallons of water—as a general precaution. When the vines start bearing in December-January, he dusts them with ultrasulphur against powdery mildew. When the vines are in flower after the October pruning, he keeps jassids and scale insects away by spraying them with DDT (50 per cent wettable) in one gallon of water.

Reddy harvests about 1,600 bunches from his vines, which fetch an average Rs. 3,200 for him. His expenditure on the various items, namely, irrigation, manures, pay of *mali*, insecticides, etc., comes to about Rs. 700 only. He has now gained so much confidence that he is looking for some land where he could have a commercial vineyard.

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Prepared by the American Team of Agricultural Specialists who visited India at the request of the Ministry of Food and Agriculture and the Ministry of Community Development and Co-operation, with the sponsorship of the Ford Foundation, this Report contains concrete suggestions that will help India realise the Third Plan target of 110 million tons of foodgrains by 1965-66.

The Report is divided in three parts. Part I deals with the need for emergency measures, Part II with action highlights enabling village farmers to increase production by better economic and administrative arrangements and better use of physical and biological resources, and Part III with planning for an abundant agriculture. It is a report which needs serious study by all those who are interested in India's food problem.

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In the south-eastern districts of the Punjab

Fertilizer Can Get You Better Returns From Wheat

by

Gurcharan Singh

Economic Botanist, Cereals and Pulses

Jullundur

FARMERS in the south-eastern districts of the Punjab could certainly get better returns from their wheat crop, if they fertilized it. Trials at the Government Research Station, Gurgaon, show that the net profit from fertilizer use comes to as much as Rs. 146 per acre!

Wheat is grown over about ten lakh acres in this tract. The soil is mostly sandy and poor, and responds well to fertilizers. The trials at the Gurgaon Station, which is fully representative of the agro-climatic and soil conditions of the area, were conducted from 1952 to 1955, with the variety *C. 281*.

Three doses of nitrogen, viz., 0, 25 and 50 pounds per acre, in the form of ammonium sulphate, were applied singly and in combination with various doses of phosphorus as superphosphate.

It was found that 50 pounds nitrogen per acre alone or in combination with phosphorus easily gave higher yield than any other treatment; the highest yield per acre (about 28 maunds) was obtained when 50 pounds nitrogen with 25 pounds phosphorus was used; the next best yield (about 27 maunds) was obtained with 50 pounds nitrogen alone. A combination of 50 pounds nitrogen and 50 pounds phosphorus gave 26 maunds per acre.

Superphosphate alone tended to depress the yield to some extent. Even in combination with nitrogenous manures, it did not increase it to any appreciable extent.

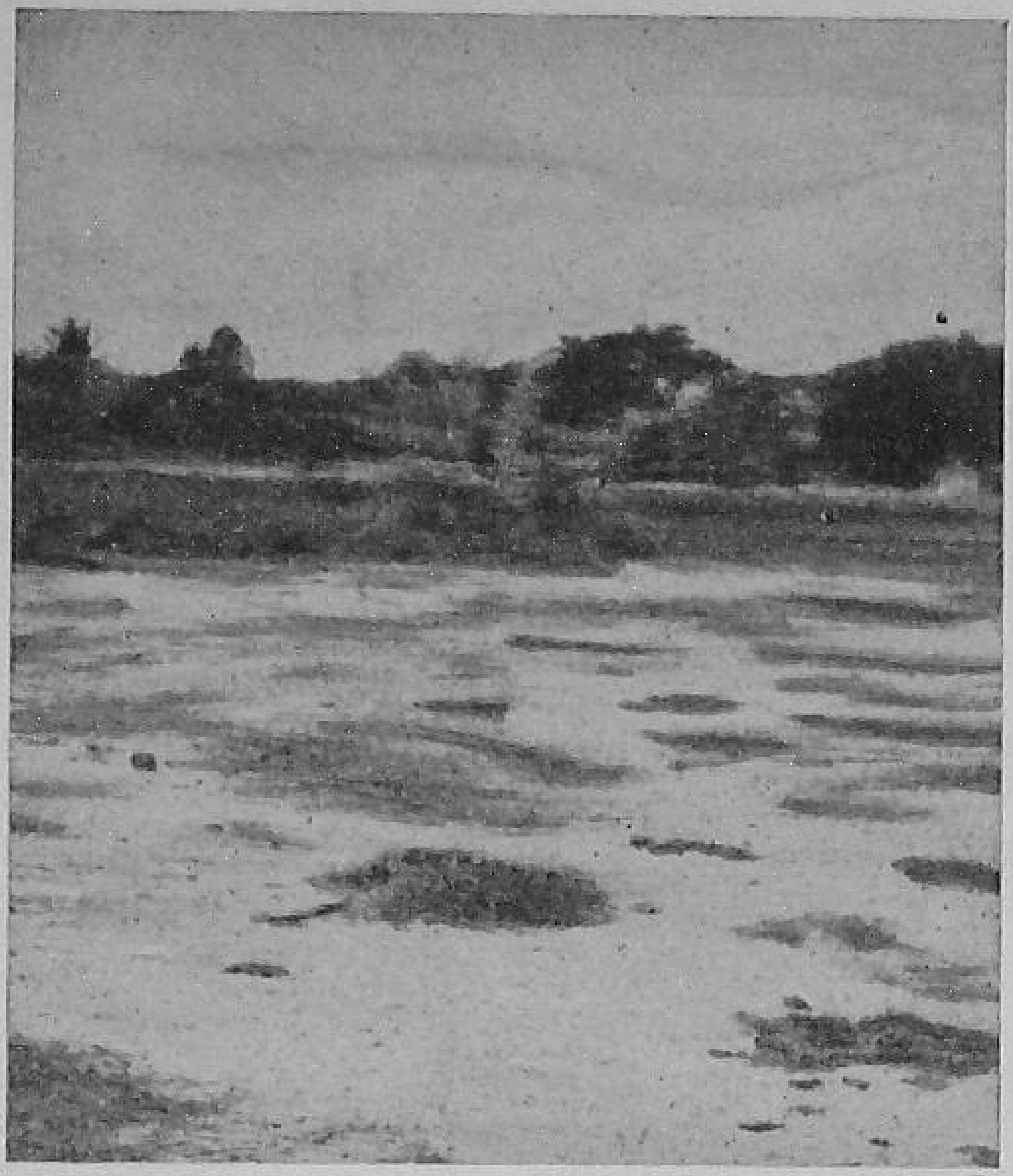
As regards the economics of the treatments, the application of 50 pounds nitrogen per acre in the form of ammonium sulphate secured the highest net profit per acre of about Rs. 146. The second best treatment, economically, was the combination of this dose with 25 pounds superphosphate, which gave a net profit of about Rs. 140. The 50 pounds nitrogen plus 50 pounds phosphorus treatment gave a profit of about Rs. 100. The price of wheat was taken as Rs. 20 per maund.

To get high profits by application of fertilizers to the wheat crop, farmers of south-eastern Punjab can adopt a 50-pound nitrogen dose per acre. If phosphorus also is to be applied in combination, the dose should be 25 pounds of superphosphate.

GRASSES CAN RECLAIM USAR SOILS

and provide fodder too

by
P. C. Nanda
and
R. C. Khera



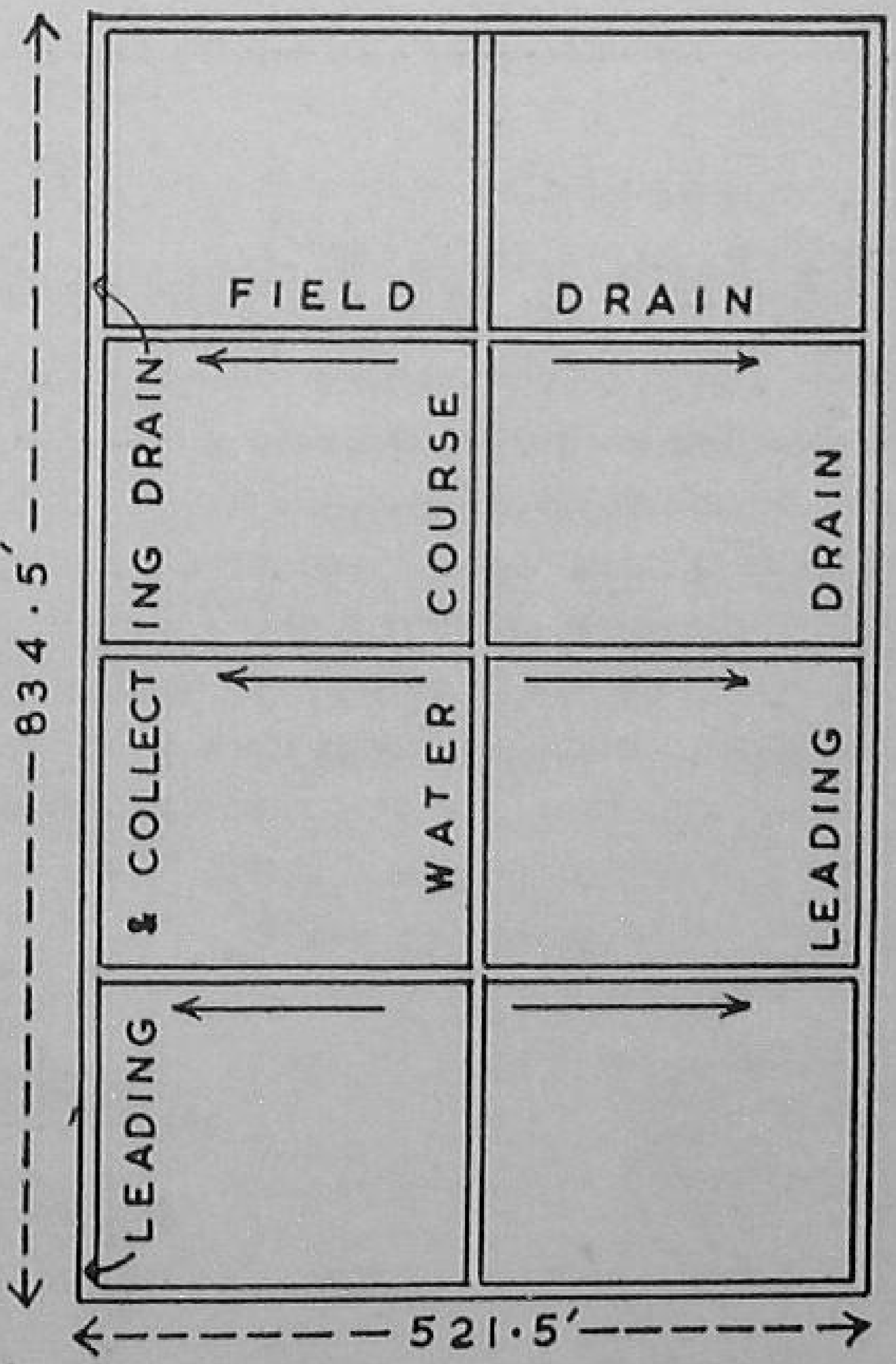
Grass struggling to grow on an alkaline soil

IN the arid and semi-arid areas of our country, there are some four to five million acres of saline and alkaline land unfit for cultivation. There is a way by which this land could not only be made fit to bear normal crops, but could also provide fine pasture for rearing cattle. It is by raising certain grasses.

These soils are commonly known as *reh*, *kallar*, *usar*, etc. They are generally clayey, fine-textured, with impeded drainage and dry. There is generally hard *kankar* or a concrete mass of limestone below the soil surface, either as a continuous pan or as scattered small lumps in the hard clay layer. Under the influence of high temperatures and evaporation, the insoluble salts of magnesium, sodium and calcium come to the upper layers and crystallize on the surface. Thus, to utilize these soils, the insoluble salts have to be converted into soluble and easily available salts.

METHOD OF RECLAIMING

Two fundamental principles are involved in the reclamation of these soils, viz., removal of excess soluble salts, and replacement of sodium and magnesium by calcium in insoluble salts. The first objective is achieved through leaching, i.e., by flooding the area with salt-free water and then draining out the excess soluble salts. This can be done effectively by laying out the drainages properly.



Plan of drains in plots for leaching excess soluble salts

The second objective can be achieved by growing grasses and also by use of chemicals like gypsum, sulphur

and sulphuric acid. The use of chemicals is expensive and does not help to reclaim these soils permanently because of their profile. Grasses, on the whole, are more useful and economic in this respect. They initiate a chain of chemical reactions by releasing carbon dioxide from the roots. This carbon dioxide forms carbonic acid with the soil moisture, which in turn reacts with insoluble carbonates of sodium and calcium to give rise to soluble bicarbonates which are available to vegetation.

FOR QUICKER RECLAMATION

While leaching is in progress, certain natural, salt-resistant grasses start sprouting. This is an indication that the soil is once again receptive of vegetation. At this stage, slip, sod or seed, singly or in mixture, of grasses like *usar ghas* (*Sporobolus arabicus*), *dub* (*Cynodon dactylon*), *Chloris virgata* and *Chloris barbata* may be planted to supplement the natural growth and help quicker reclamation.

After maintaining these grasses for about a year or two, they may be ploughed up and *anjan* grass sown in rows or broadcast soon after the first monsoon shower. The *anjan* grass is hardy, salt-resistant and makes fine fodder, providing fine grazing and fodder for milch cattle.

Since the grasses will utilize the nitrogen from the soil which is normally deficient in nitrogen and phosphates, better restore these by ploughing in organic manure and fertilizers.

Besides providing high quality and cheap feed for livestock, these grasses will help in building the soil by adding organic matter and improving the tilth and internal drainage of the soil. This means that after remaining under grass for about four to five years, such areas will become suitable for taking normal crops. Depending upon the soil profile and condition, it will be desirable to take crop and grass alternately so as not to allow these soils to return to their original state.

The Earth is his Heritage — Today's child-Tomorrow's farmer

Basic education and modern technology will help the farmer use his land to the best possible advantage for the benefit of his country, his sons and his sons' sons. Each successive year will see more and more tractors and implements assisting him in his productive labours. And all those tractors need tyres—Firestone tyres—for it was Harvey Firestone himself who made the first pneumatic farm tyre thereby opening up a better future for farmers throughout the world.

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A WINDMILL?

by

C. K. Ashdhir

WHEREVER a steady breeze of five to six miles velocity per hour is available, the windmill can easily replace human and animal power for lifting water from wells, *baolis* and canals for irrigation or for drinking. In India, the windmill has not been much used so far, but the possibility of its popularization is now being looked into by the Union Ministry of Natural Resources and Scientific Research.

The windmill is not a recent invention, having been invented in Holland as far back as 100 A.D. In Europe, it has been in use for centuries and has proved invaluable in rural development. It is now used the world over.

The windmill can be used for pumping drinking water and irrigating small vegetable gardens, etc. Its working capacity is not enough for large-scale irrigation.

The old-type windmill required a wind velocity of 15 to 25 miles per hour for its working, but for the improved model, a velocity of five to six miles per hour is enough.

On the basis of wind-velocity, India can be divided into two regions. In the first region, the wind-velocity is fairly high for most of the year; in the second, it is high from March to December but low for the rest of the year. Under the first region come Bombay, Saurashtra, Kutch, Belgaum, Coimbatore, Kerala, Jodhpur, Jaipur, Bikaner, coastal Orissa and Andhra Pradesh, and in the second, the rest of India—Hyderabad, Madhya Pradesh and from Punjab to West Bengal. The first region presents no difficulty in the successful working of the windmill. In the second region, perhaps some specially-designed windmill can be used during certain periods of the year.

In this connection, the following data are interesting and useful.

Where there is lack of rain and the water-table is at a depth of 100 to 200 feet, the velocity of the wind

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is high and is capable of lifting water to this height.

Wind-velocity is higher in the hot season, when the need for water is also greater.

Where the water-table is fairly high, the wind-velocity is low.

Much experimental work has gone into the designing of the windmill and it has been found that the windmill owes its speed and power not to the pressure but to the velocity of the wind striking its blades. Its power depends more on the tips of the blades and other factors than on the area of the blades. The windmill should be installed in positions where there is a steady breeze.

CONSTRUCTION

The windmill is made of zinc sheets and steel rods, and is mounted on a four-legged tower 30 to 60 feet high. Its diameter is between six and 20 feet. The rotating fan, by means of a sprocket wheel, converts its circular motion into vertical motion and rotates the axle. This in turn works pumps, flour mills, electric generators, etc.

Early in this century, Sir Alfred Chatterton conducted experiments at Madras with a windmill mounted on a 70 feet high tower. An eight-inch diameter pump could thus be run and water lifted to a height of 25 feet. He found, by means of a wind-gauge placed in the tower, that a wind-velocity of eight miles per hour could work a windmill well, and that even a wind of three miles per hour could lift some water by turning the windmill off and on. Sir Alfred studied the air currents at about 28 places in Madras and came to the conclusion that there were many places in India where the windmill could be used.

With a four to nine miles per hour wind, the windmill can at the most lift 3,000 to 6,000 gallons of water per day. The best thing, therefore, would be to instal a water tank on a 15 to 20 feet high tower, in which water can be stored when the windmill is working.

ECONOMICS

To a large extent, the utility of the windmill depends on its capacity and construction. A 12 feet wide and 40 to 60 feet high windmill can cost Rs. 2,500 to 3,000. When installed properly, the annual expenditure should not exceed Rs. 100 or 125.

Here are the advantages of having a windmill. It does not need an operator. Throughout the year, it requires only a little grease to work properly. When installed properly, it gives 20 to 25 years of good service. It is an economic means of lifting drinking water in villages.

Farmers who are interested in setting up a windmill can do so after consulting their State Department of Agriculture or the Council of Scientific and Industrial Research, New Delhi.

The Karnal Substation Completes 25 Years of Useful Research

by
P. C. Raheja, R. S. Gupta *and* **L. L. Relwani**
Indian Agricultural Research Institute
New Delhi

THE I.A.R.I. Agricultural Research Substation at Karnal, which recently completed 25 years of its existence, can rightly feel proud of the contribution it has made towards the improvement of farming and animal husbandry in northern India.

It was in 1934 that the Substation was established to work on problems of mixed farming on a large scale. There already existed a breeding herd of Tharparkar cattle which was to serve as the nucleus in this work. The objectives were: to improve the milk yield of the herd and bring out its dual-purpose characters; to conduct research on fodder production and preservation; to carry out research on the rice and wheat crops to raise their production in northern India; to take up an integrated programme of research on cultivators' holdings of various sizes under canal irrigation; and to work out the economics of mechanized farming. With the transfer of the herd to the Cattle-*cum*-Dairy Farm in 1950-51 and subsequently to the National Dairy Research Institute, however, the research programme was slightly altered.

Originally, the cultivated area was 1,054 acres. Of this, about 300 acres were paddy land, 480 acres were earmarked for grazing and production of grass hay, and the remaining were under arable farming. The entire irrigated area receives its water supply from the Western Jamuna Canal, which is adequate during the monsoon season but is limited during the *rabi* and pre-monsoon seasons. Quite a high proportion of the cultivated area, therefore, could not be double-cropped in any one season. With adequate seasonal grazing and fodder supplies from irrigated lands, the system of mixed farming proved quite a success.

When the Tharparkar herd was taken over in 1936, it had 55 cows in milk. This number was gradually increased to 79 in 1949, which raised the percentage of cows remaining in milk from about 54 to 64. The herd's average milk yield was 15.6 pounds per cow per day, which touched the figure of 21.4 pounds in 1943, and thereafter was stabilized at about 20 pounds; the overall average in 1936 was 9.9 pounds and in 1949, 13.5 pounds. Thus, a substantial improvement in the herd was brought about by proper selection and feeding of animals.

MIXED FARMING

Improvement in milk yield is basically dependent on adequate supplies of fodder, hay, silage and feed for livestock. Besides, the yields of cereals and commercial crops in the cropping must be stepped up. For increased production of fodder, improvement of cultivated fodders and pasture land was carried out side by side. Berseem and cowpeas were introduced as leguminous fodders.

Manurial experiments on berseem established that it required about 60 pounds phosphorus (400 pounds single superphosphate) to step up its production by 40 per cent. The outturn averaged 600 maunds per acre. The extra production due to superphosphate application is available in the first three cuttings when fodder scarcity is most acute.

Berseem can be converted into hay by curing it on wires for feeding animals when fodder is not available

The yield is about 15 per cent of the green fodder. It is greatly relished by milch cattle and increases their milk yield.

In a trial of a world collection of cowpeas, four varieties were finally selected. Of these,

Jowar **and cowpeas grown together**

the type *N.P.(K) 397* proved to be the best. It can be grown for fodder right from March to August and yields up to 250 maunds of fodder per acre in 90 days. *N.P.(K) 585* was found suitable for cattle feed as a pulse crop.

Of the various *jowar* varieties, *J.C. 20* and *J.C. 21*, which are sweet fodder sorghums, were selected for their high yield and superior feed value. *Jowar* gives very profitable returns with 40 pounds nitrogen ($2\frac{1}{2}$ maunds ammonium sulphate). The cost of production of this fodder being extremely low when raised during the monsoon season, it has proved very useful for preparing silage on a large scale.

518 tons of farmyard manure and two tons of ammonium sulphate multiply *jowar* **yields manifold**

Paddy transplanted at 10 in. x 10 in. has given 25 per cent more yield than broadcast paddy

Maize and cowpeas make an extremely good fodder mixture much relished by cattle. Yellow maize *N.P. 2* and cowpeas *N.P. (K) 397* can be sown right from early April to the middle of August. With heavy manuring, the yields touched 400 maunds per acre.

Another successfully grown fodder crop has been oats. Three varieties evolved by the Indian Agricultural Research Institute, New Delhi, were tested in large blocks. The *N.P. 1* variety yields over 250 maunds of fodder per acre and can withstand nitrogen application of up to 40 pounds nitrogen. It has been found to be a very suitable source of cereal feed for milch stock. On large blocks, it has given an outturn of about 25 maunds per acre; top yields of 40 maunds have also been obtained in small blocks. It can be successfully grown after the paddy crop in late October.

Barley, gram and peas are the other cattle feed crops which have been extensively grown. The varieties found suitable are *N.P. 13*, *N.P. 58* and *N.P. 29*, respectively. Application of 40 pounds nitrogen to barley has been found very profitable. The optimum dressing for peas is about 60 pounds phosphorus ($4\frac{1}{2}$ maunds superphosphate) per acre.

FOOD CROPS

Prior to the setting up of the Agricultural Research Station, the Indian Council of Agricultural Research had a Rice Breeding Scheme running at Karnal. As a result of selection work, important varieties of paddy like *N.P. 97*, *N.P. 125*, *N.P. 130* and *N.P. 137* were evolved. The first variety is a bit coarse but of short duration. The variety *N.P. 137* is fine-grained and superior, but being of long duration it has not found favour with farmers of the tract. The paddy growers of Karnal district have very largely adopted *N.P. 130*, which is medium-fine and matures in about 110 days.

An excellent implement for de-weeding paddy fields is the Japanese hoe

They can follow it up either with berseem, oats or gram the following November. Top yields of 60 maunds have been obtained with optimum manuring and irrigation; on 100-acre blocks, the yield averaged 33 maunds per acre.

MANURING OF PADDY

Here are some of the outstanding results of manurial trials on paddy.

(a) In the berseem-paddy rotation, application of 60 pounds phosphorus enriched the soil so much that the paddy yield increase corresponded to application of 40 pounds nitrogen directly to the paddy crop.

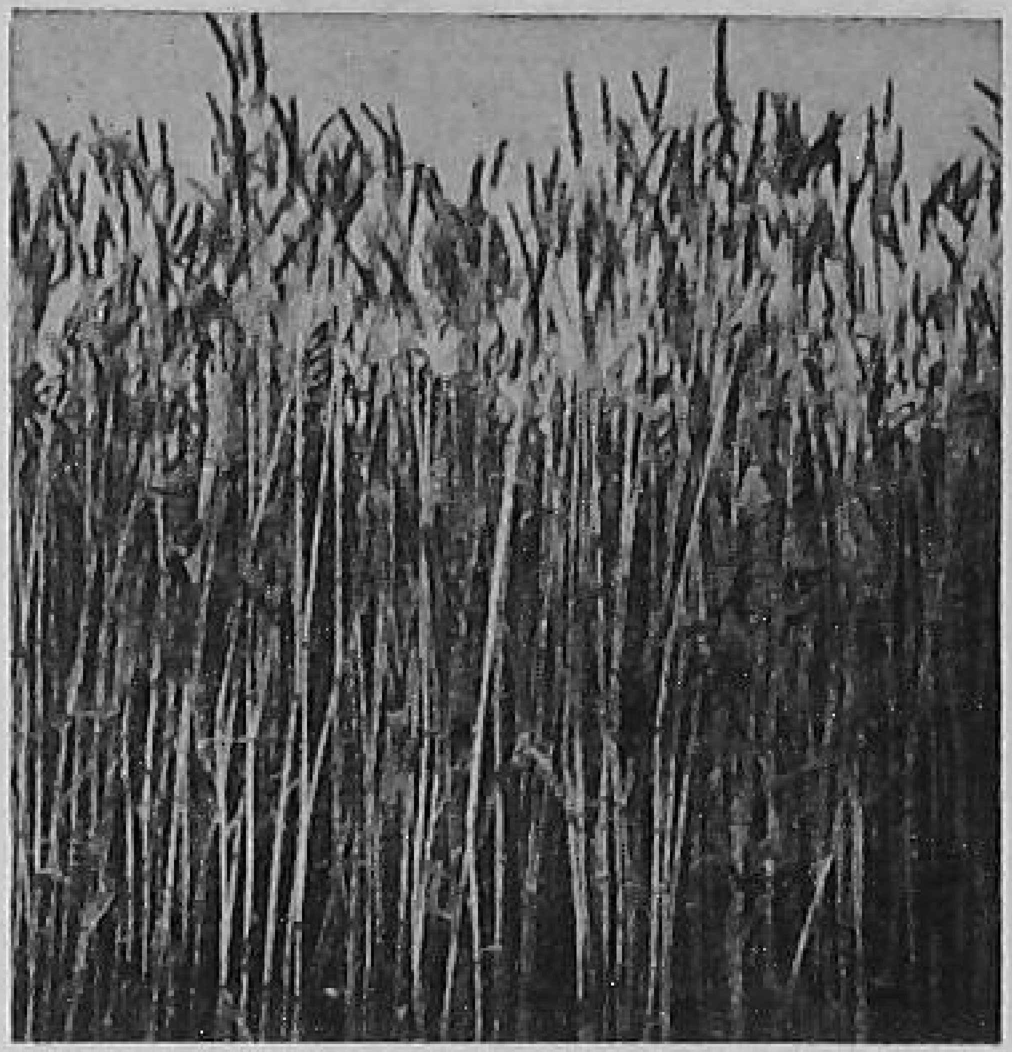
(b) Application of up to 3.75 maunds of ammonium sulphate per acre was remunerative, provided the soil was not very fertile which makes the crop prone to lodging. On soils of above-average fertility, the most profitable dose is 2½ maunds of ammonium sulphate. The extra yield obtained is about 7.5 maunds per acre. Half this dose increased the yield by about five maunds. Split application of ammonium sulphate or urea—half at transplanting and half at tillering, proved slightly more beneficial than a full application at transplanting.

(c) The green manure of *dhaincha* (*Sesbania aculeata*) when buried two weeks in advance of transplanting paddy gave an extra yield of about six maunds to an acre.

(d) Application of farmyard manure was less profitable than either dressing with fertilizer nitrogen or green-manuring the crop. A dose of 400 maunds increased the yield by about five maunds per acre.

(e) New fertilizers such as urea, ammonium sulphate-nitrate and ammonium chloride were observed to be as effective as ammonium sulphate when applied on an equal nitrogen basis to the soil.

(f) The optimum spacing for transplant paddy was found to be 10 in. × 10 in. Transplant paddy gave 25 per cent more yield than broadcast paddy, but paddy drilled at the rate of 20 seers in ten-inch rows gave as high a yield as the transplant crop. The extra cost of weeding in transplant paddy equals the cost of transplanting paddy seedlings.



N. P. 718 **wheat is an early ripener and resistant to Loose Smut**

Of the improved varieties of wheat evolved by the Indian Agricultural Research Institute, New Delhi, *N.P. 718*, *N.P. 809*, *N.P. 823* and *N.P. 824* have been found very promising at the Substation. *N.P. 809* is beardless and somewhat late-maturing. Therefore, it is

A good crop of ***N P. 130*** **paddy**

not being distributed to farmers, but has been multiplied year after year for distribution in Himachal Pradesh where it has proved highly rust-resistant. *N.P. 824* and *N.P. 823* are improvements over *N.P. 718*, for they stand high levels of fertilization; their grain also is more attractive. Their multiplication was taken in hand only last year. *N.P. 718, N.P.799, N.P. 797* and *N.P.798* are multiplied on an area of about 150 acres every year for distribution as nucleus seed to different states and progressive growers. Under certain conditions, these varieties are rust-tolerant.

The following is a summary of results of cultural and manurial investigations on wheat conducted at the Substation.

(a) With normal rains in the monsoon and winter seasons, September flooding of fields from surplus canal supplies is sufficient to mature the wheat, gram and *sarson* crops.

Deeper placement of superphosphate with *pora* and dropping of seed in furrows by hand increases wheat yields in phosphate-poor soils

(b) Mechanical cultivation gives as much yield as tillage with bullock-drawn implements. Ploughing deeper than five inches for preparation of land is wasteful. Mechanical cultivation is time-saving and comparatively less costly than bullock cultivation.

(c) Green manuring with sannhemp increases the yield by about 3½ maunds; this is further improved by application of 40 pounds phosphorus to the sannhemp crop. Cowpeas is another green manure crop which can be recommended for the area served by the Substation.

(d) Twenty and 40 pounds N (1¼ and 2½ maunds ammonium sulphate) per acre increase the yields on an average by three and 4½ maunds per acre. This is more remunerative than application of 200 to 400 maunds farmyard manure. Other sources of nitrogen, namely, urea, ammonium sulphate-nitrate and ammonium chloride, which cost relatively less per unit of plant food, can also be safely applied.

***Dhaincha* makes an excellent green manure for paddy**

COMMERCIAL CROPS

Two important commercial crops which occupy a definite place in mixed farming in the region are cotton and sugarcane. The varieties being multiplied are *H.14* and *216F* cotton and *Co.312* sugarcane. In six-acre holdings of cultivators in which cropping had been arranged for mixed farming, the results showed that inclusion of sugarcane is more profitable than cotton for this region. The cotton and sugarcane yields have averaged 14 maunds of seed cotton and 700 maunds of millable cane, respectively. Sugarcane requires a dressing of ten tons farmyard manure and 80 pounds nitrogen (five maunds ammonium sulphate) per acre. Top yields of 1,200 maunds of cane have been obtained at the Substation. Cotton requires a dressing of about 3¾ maunds of ammonium sulphate for optimum yields. Earthing of the crop is extremely helpful in reducing the ill-effects of water-logging. Experimental work on the screening of cane varieties for red rot and wilt resistance has been in progress for the past 15 years and has provided important data to sugarcane breeders at Coimbatore.

More recently, work on vegetable and oilseed crops also has been taken in hand. Seed of *O.N.45* potato has been multiplied. This potato fetches two rupees more per maund in the market. The seeds of rust-resistant strains of linseed are being multiplied. The most useful type found for the area is *N.P.(R.R.)9*. The other varieties under multiplication are *N.P. (R.R.)5* and *N.P.(R.R.)45*, the seeds of which are supplied to growers in other states.

FARM MECHANIZATION

Trials with petrol and diesel oil tractors have shown that the cost of operation with the latter is comparatively less, as also the running and repair costs. For irrigated

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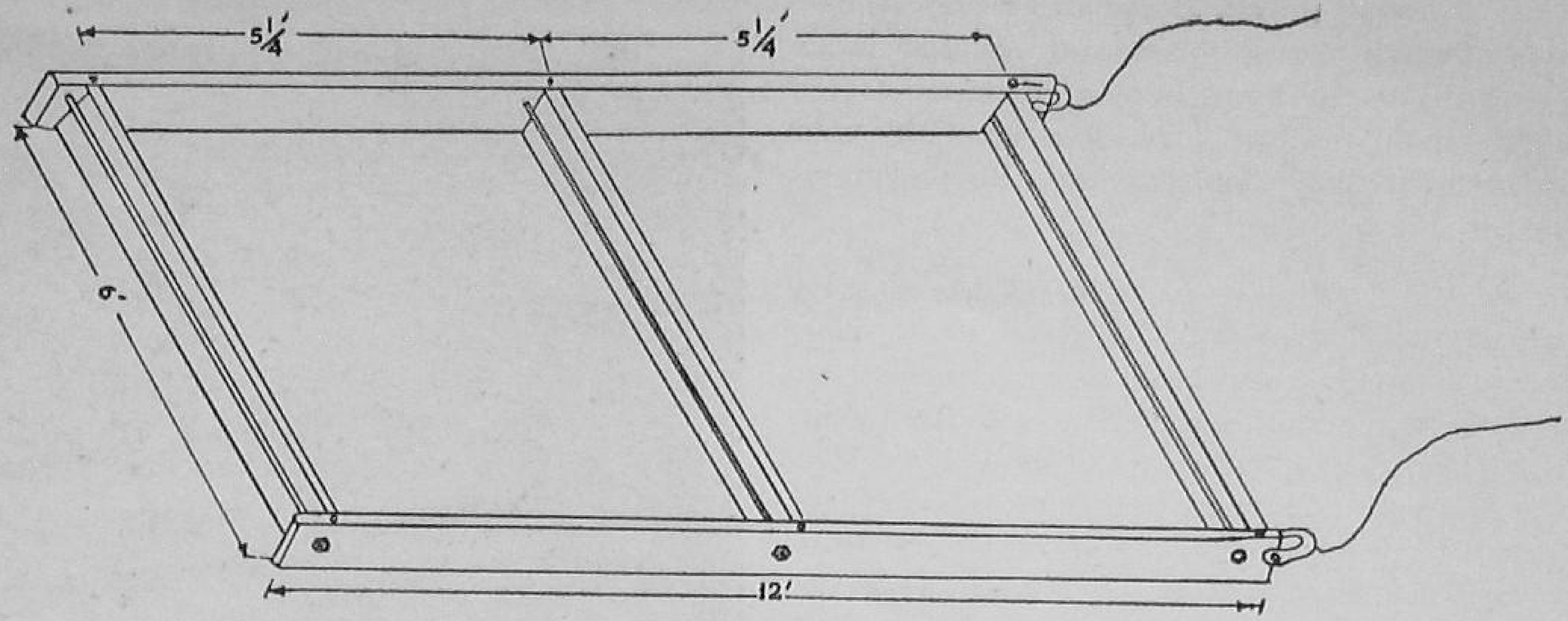


The float showing dimensions

Better Level Your Field With

THE I. A. R. I. FLOAT

by

E.G.K. Rao, Mukhtar Singh *and* **R.S. Kahlon**

Indian Agricultural Research Institute
New Delhi

IT is estimated that just by levelling the field properly for irrigation, about 15 per cent increase in crop yield could be expected. Levelling of the field is particularly important in India where surface irrigation is most common. But, partly due to want of a suitable implement that the average Indian farmer could afford and partly due to lack of knowledge about the technique of proper levelling, this has not usually been done.

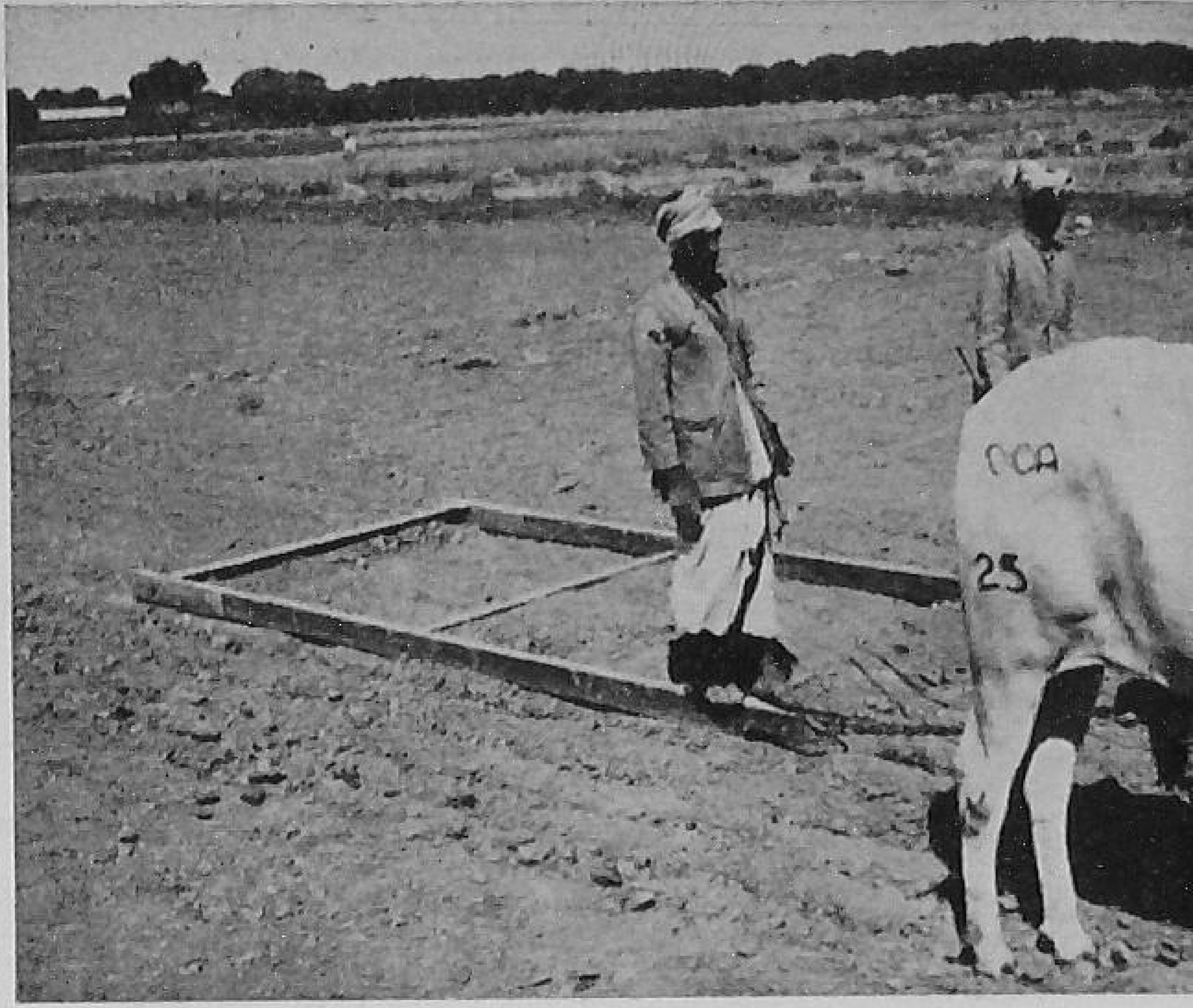
Irrigation of uneven land involves considerable wastage of water, as low spots receive too much water and high spots are partially deprived of it. The former remain wet for long periods, while the latter dry up quickly, much to the detriment of crops and the subsequent tillage operations. This also results in an uneven stand of the crop. The crop in the low-lying areas suffers mostly from leaching of nutrients, particularly nitrates. Under heavy rainfall, such spots are also subject to ponding of water which cannot be drained away. An uneven surface also makes it difficult to sow the seed at a uniform depth.

A vegetable grower often divides his field into small-sized, more or less level beds or compartments, and further levels them individually with the spade. However, the labour involved cannot be justified for most field crops. This is particularly true under canal irrigation, where the basins or beds tend to be large. Usually, pits and depressions are filled up by moving earth from mounds with scrapers (*suprahs* or *karahas*). However, small depressions and mounds are neither easy to detect nor to level. The only implement the cultivator has is the *sohaga* or *patella* which follows the contours and at best is a land-smoothener, leaving the undulations undisturbed.

Even if the land is initially level or has been levelled carefully, the soil surface is subject to uneven settlement and disturbance by cultural operations such as ploughing or removal of earth for repairing irrigation channels

and for diverting water. Furrow-inversion ploughs are the worst offenders in this respect, and that is one reason why they have not been as popular as their usefulness would warrant. That has made the need for a complementary tool for land levelling more keenly felt.

In the U.S.A., preparation of the land is given special attention before water is let on to it. After rough levelling with heavy machinery such as motorized scrapers, the final smoothening is done with land planes or "floats" by running them up and down the field as often as necessary. These are usually 30 to 60 feet long and drawn by heavy tractors. Such large-sized floats are beyond the means of an Indian farmer. However, a float has now been designed at the Agricultural Engineering Division of the Indian Agricultural Research Institute, New Delhi, which is well within his means—costing about Rs. 75. It can be constructed and maintained by the village carpenter, and is sturdy and easy to operate.



The float in operation, with men standing on it for extra weight

HOW TO CONSTRUCT IT

The float measures 12 feet × 6⅓ feet. It consists of a wooden frame with two side-planks and three cross-planks—one in front, one in the middle and one at the rear. Each side-plank is 12 feet long, 4½ inches high and two inches thick, while each cross-plank measures 6⅓ feet × 4½ inches × 2 inches. The rear cross-plank slopes backward, while the other two stand vertical. These cross-planks are supported at the back by steel rods. Two iron rings are provided at the front for hitching the bullocks.

It is seen that instead of a single plank as in the *sohaga*, three cross-planks are provided in the I.A.R.I. float. The first and the second, particularly the latter, move the earth. The rear one gives a smooth finish. To reduce wear and tear of the cross-planks, they can be reinforced with a lining of steel plates.

INSTITUTE TRIALS

In trials at the Institute, the implement was hitched to two pairs of bullocks and tried on a field with sandy loam soil, under different conditions. The following are the observations made during the trial.

In the case of land previously cultivated with the *triphali* and not planked, the draught recorded on each pair of bullocks was 95 to 115 pounds. The float did a good smoothening job.

On land cultivated previously with the *triphali*, with men standing on the middle or the front plank for extra weight, the draught recorded on each pair of bullocks was 160 to 200 pounds. The implement moved a considerable quantity of earth.

In the case of land previously cultivated and planked, the draught on each pair of bullocks was 30 to 35 pounds. The float worked smoothly, but did not move much earth when men did not stand on it.

When the float was run for levelling after cross-ditches and ridges were artificially made with the plough and spades, about 90 per cent of the depressions were filled up in one pass.

The float was set behind a grubber hitched to a tractor. When the chains were kept long enough, the float moved a fairly good amount of earth, even when no men stood on it.

It was noticed that for best results with the implement, the soil should ber easonably dry, powdery and free of large clods, so that the earth picked up from high spots slips off readily into the low spots. For proper levelling, it is important that the float should be in proper alignment. That is, the three cross-planks should have their working surfaces, i.e., the under-surface, at the same level. This can be readily checked by stretching a string at various points both along the length as well as diagonally. The float should be checked for alignment before commencing the operation.

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WHAT'S NEW IN FARMING

STORING ARECANUTS

FOR storing small quantities of arecanuts, better use either glazed pots or *bharanies.*

Warm the pots well and brush with paraffin wax to make them perfectly water-tight. To keep the nuts moist, see that they are completely immersed in water; place a small, clean bag of washed sand over them, below the water surface.

Addition of benzoic acid prevents rotting. For every 200 nuts in a pot, use slightly less than three-fourths of an ounce of it (costing about 20 nP) dissolved in seven litres (about four seers) of hot water.

First, put in the nuts. Then, place the sandbag over them. Pour in the benzoic acid solution, and close with a tight-fitting lid, preferably placing another bag of dry sand on it to prevent mosquitoes getting in.

The nuts would keep good for at east ten months this way.

HIGHER *CHOLAM* YIELDS

FARMERS growing rain-fed *cholam* (*jowar*) in Madras can get higher yields by giving a spacing of nine inches between plants and 15 to 16 inches between rows.

When *cholam* is grown mixed with *lablab* (Coimbatore district) or with red gram (Salem and North Arcot districts) nine pounds of *cholam* and three of *lablab* or red gram should be used for sowing an acre.

Growing a mixed crop like this is more economic than growing a crop of *cholam* alone.

It is also advisable to select heavy seeds, eliminating immature or ill-filled grains, for sowing. Before sowing, *cholam* seed should be treated with "Agrosan GN" at an ounce of the chemical for 30 pounds of the seed, to safeguard against disease.

Line-sowing is also a *must* for all *cholam* farmers.

DIBBLING IS MORE ECONOMIC

PROFITS double in the case of certain crops when you dibble the seed instead of drilling it.

This was observed at the Agricultural School, Borgaon, in North Satara district of Bombay State, when a drill-sown *jowar* crop was compared with a dibbled one. The results with groundnut were similar.

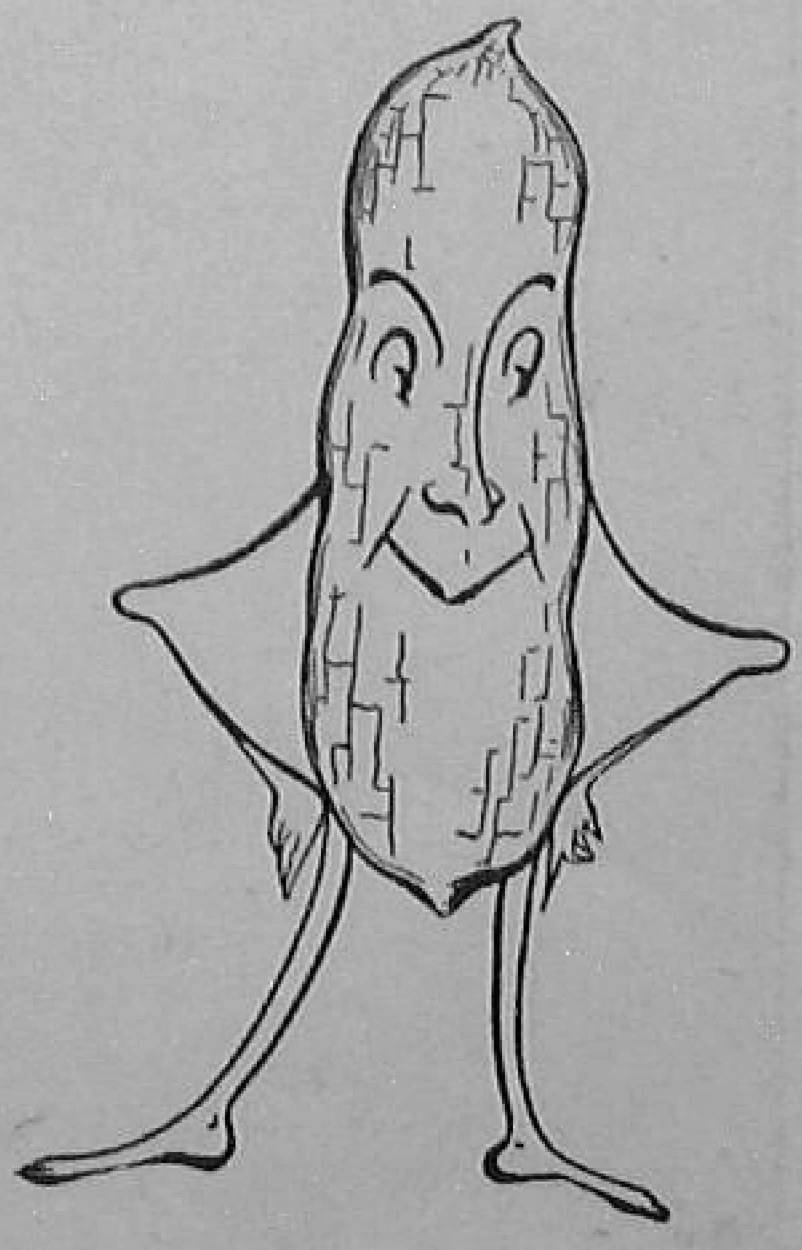
Compared with a drilled crop, a dibbled crop facilitates interculturing and topdressing. Also, every single plant in the dibbled crop gets a chance to develop well and give a uniform and good growth.

The cost of cultivating an acre of drill-sown *jowar* was Rs. 165; in the case of the dibbled crop, it was Rs. 180. The income from the drilled crop was Rs. 235, thus leaving a profit of only Rs. 70. The dibbled crop, on the other hand, brought in Rs. 328, leaving a profit of Rs. 148 per acre!

With groundnut, the profit per acre from the dibbled crop was Rs. 290 as against Rs. 154 from the drilled crop.

GROUNDNUT WITHOUT '*TIKKA*'

BOTHERED by the *tikka* leaf-spot disease on your groundnut crop? Then, take these tips: treat the groundnut seed five days before sowing with "Agrosan GN" at five ounces of the chemical for 112 pounds of seed; if the disease appears on the crop, spray one per cent Bordeaux mixture (5:5:50) or dust the crop with fine sulphur (320 mesh) at 20 to 25 pounds per acre. You may have to spray or dust twice or thrice, depending on the severity of the disease, to bring it completely under control.



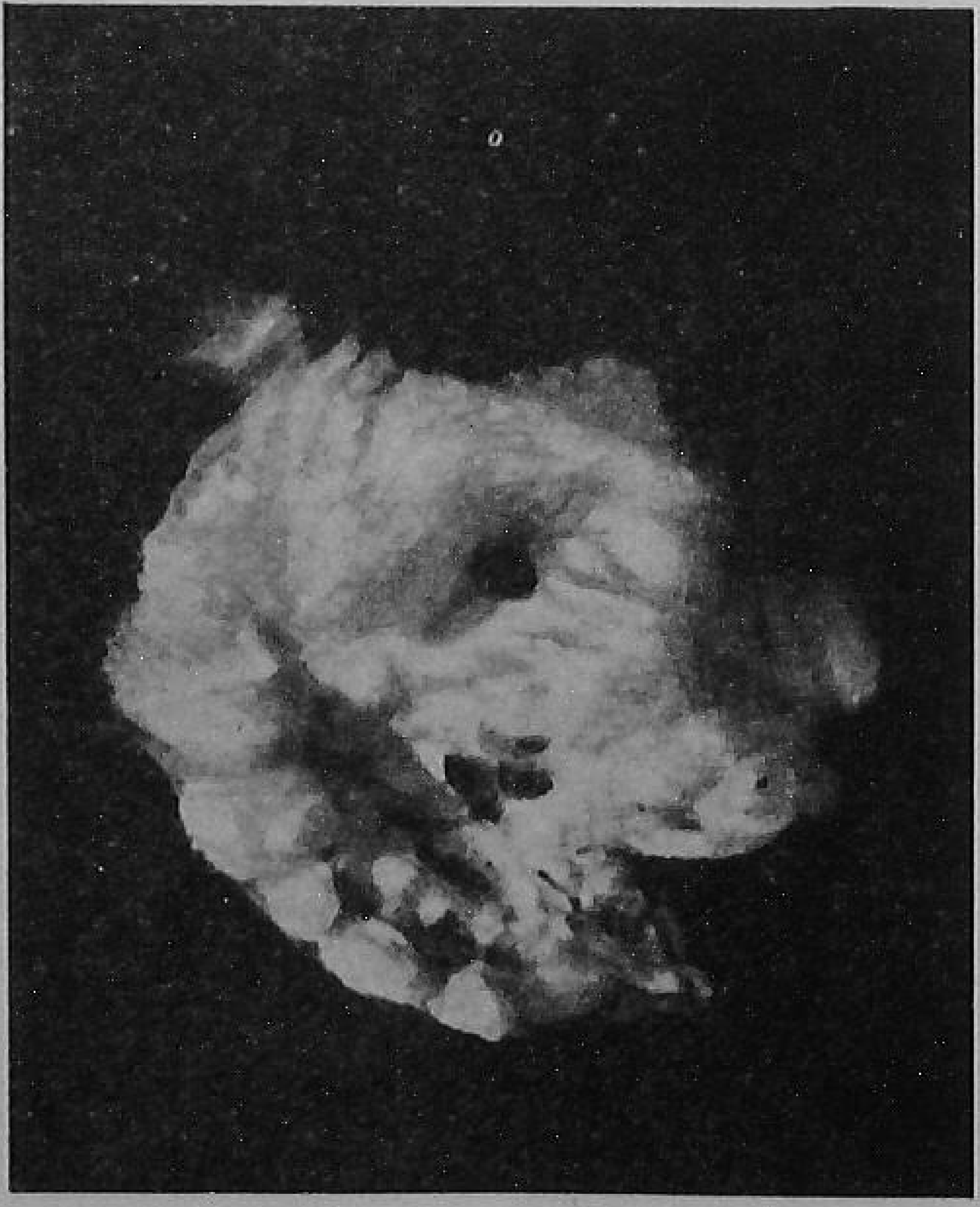
Meet the Siamese Silk-cotton Tree

by
S.M. Wakankar
Agricultural Research Institute
Gwalior

The capsules that contain the silky fibre

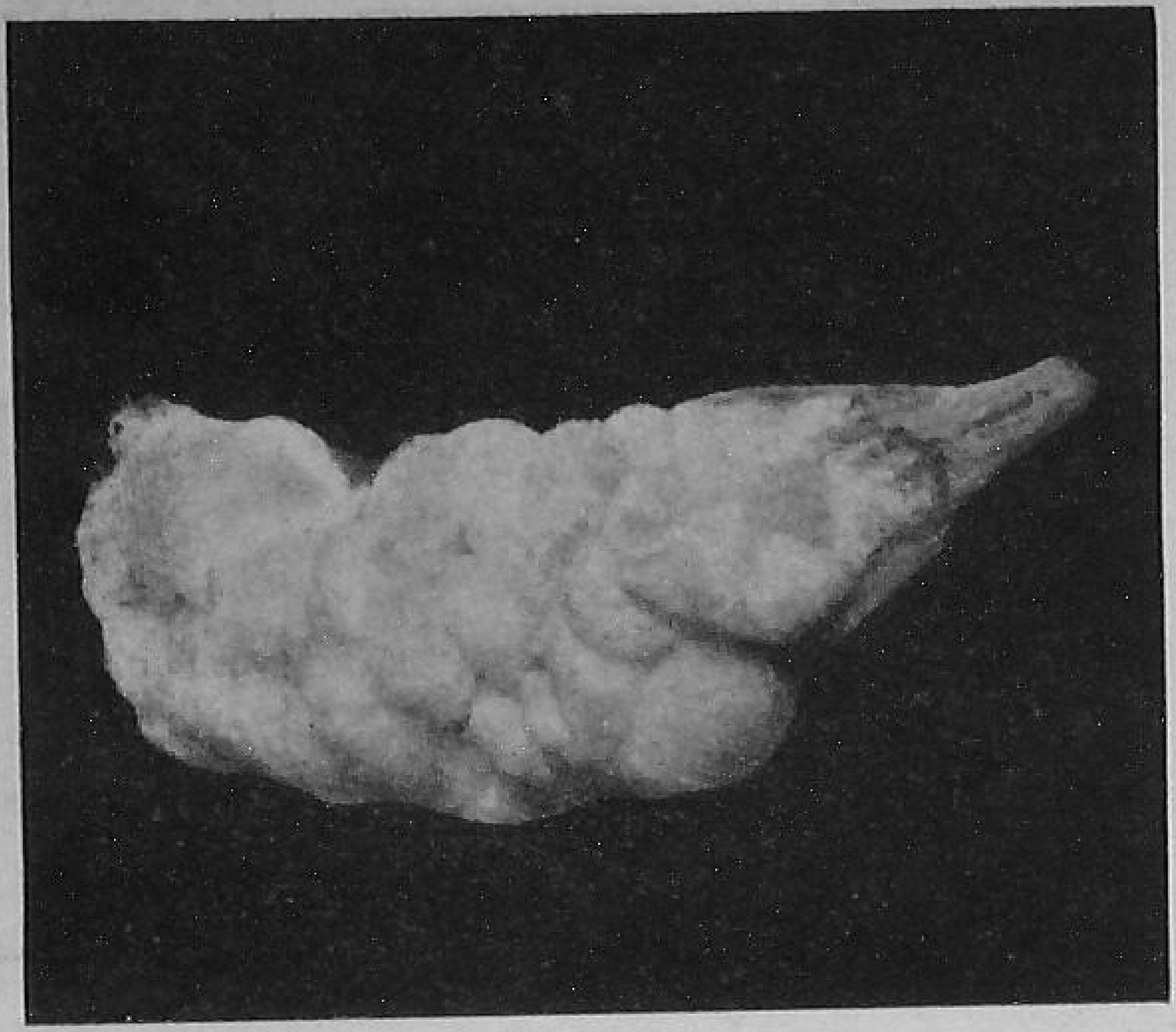
This is how the silk-cotton tree bears flowers

A capsule opened out to show the seeds



IT appears from trials conducted at Gwalior that the Siamese silk-cotton tree can be successfully grown over large parts of our country. It is so hardy that it scarcely needs any attention and could adapt itself to varying soil and climatic conditions.

The Siamese silk-cotton tree is the *kapok* of trade and belongs to *Eriodendron* species. Seeds of the Siamese variety *E.C. 6101*, received from the Indian Agricultural Research Institute, New Delhi, were planted at Gwalior in the second week of July, 1954, when the monsoon



The fibres are soft and silky

broke, and were transplanted in the middle of August when the plants were three to four weeks old.

After transplanting, not much care was taken of the plants except that the soil near them was kept clean of weeds and grasses. During the summer of the first year, the plants were watered every fortnight.

The growth of the plants was rapid and they appeared sturdy. They could bear the severe summers and winters of Gwalior where the maximum temperature touched 46·6°C (116·0°F) and the minimum 0·94°C (33·7°F). The rainfall at Gwalior during the period of growth of the silk-cotton trees ranged from 854 mm. (33·6 inches) to 1,464 mm. (57·6 inches). The Gwalior soils are sandy loams.

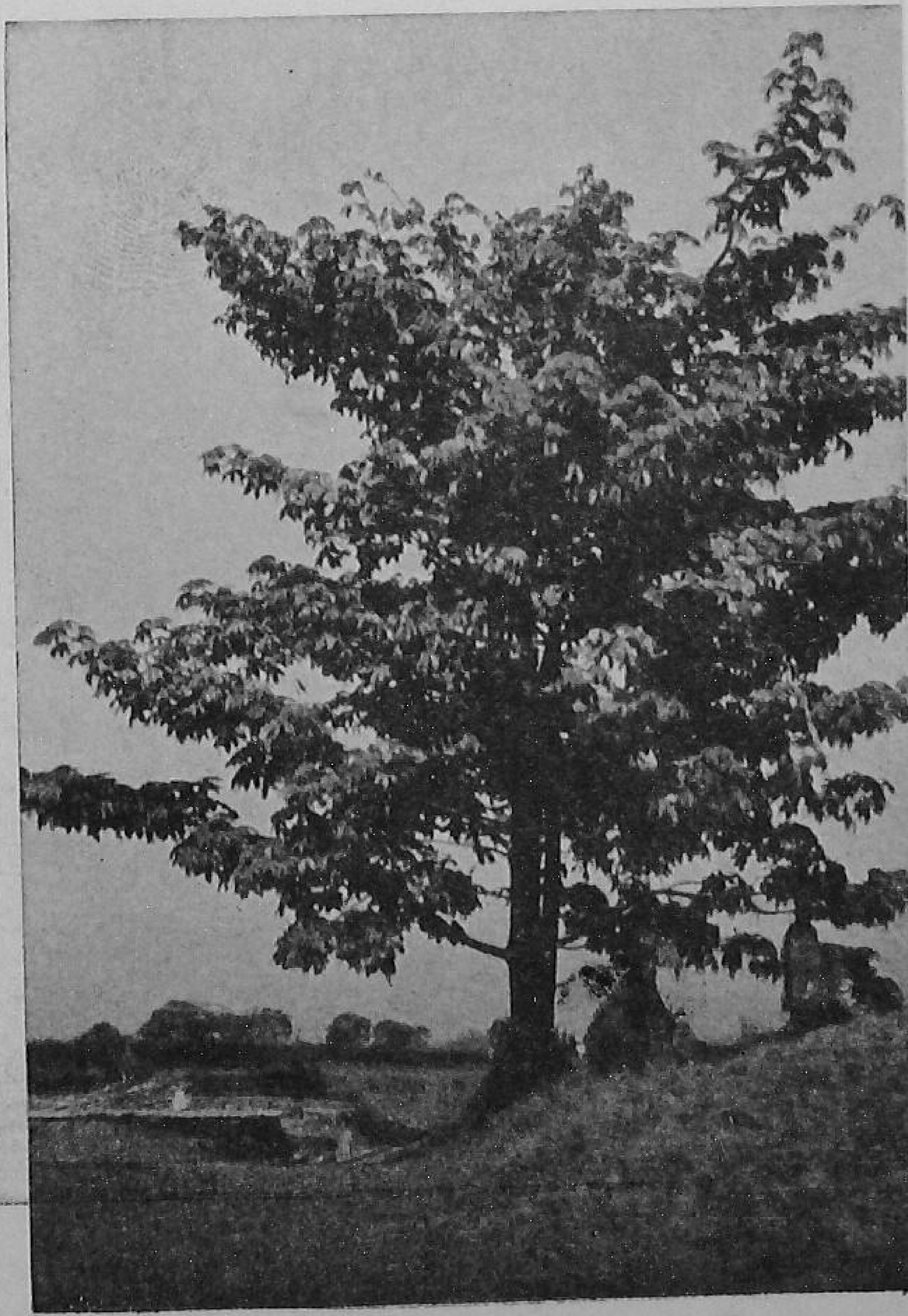
Of the 17 seedlings planted, 16 survived. Flowering was observed in four trees in 1958, after four years. Flowering commences from the middle of February and continues till the first week of April. Full-grown capsules are formed in the last week of April, and they ripen by the end of April or in early May. The average length of the capsule is 15 centimetres. The tree grows to a height of about 12 to 15 feet in the five years of its growing period.

The fibres of the Siamese silk-cotton tree are fine, soft and silky. There is a demand for these for use as fillers in the furnishing and upholstery industry. The seeds are naked, round and black in colour.

Apart from the fibres, the bark contains long, coarse fibres which are very strong. These fibres may lead to some new fibre industry.

The Siamese silk-cotton tree deserves to be grown and tested over large areas.

A five-year old tree



★ ★ ★

SOME TIPS

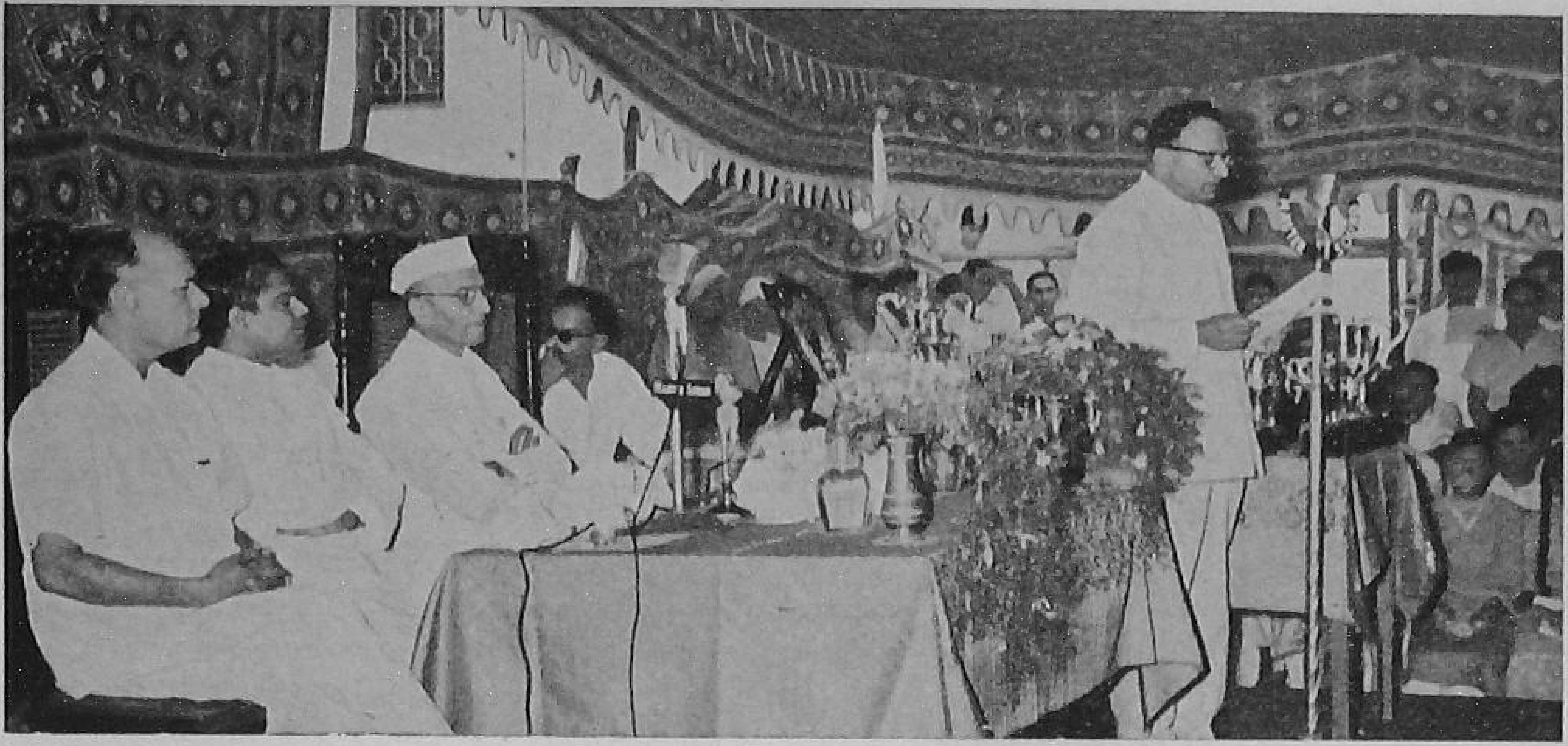
BOTHERED by white grubs attacking arecanut roots? Apply "Folidol" at eight ounces in 100 gallons of water to the soil.

* * *

ARECANUT husks are not just a waste. Hard board has been prepared from them at the Forest Research Institute, Dehra Dun, by using lime as a cooking agent.

* * *

IT's easy to control the rhinoceros beetle—by using BHC and "Chlordane".



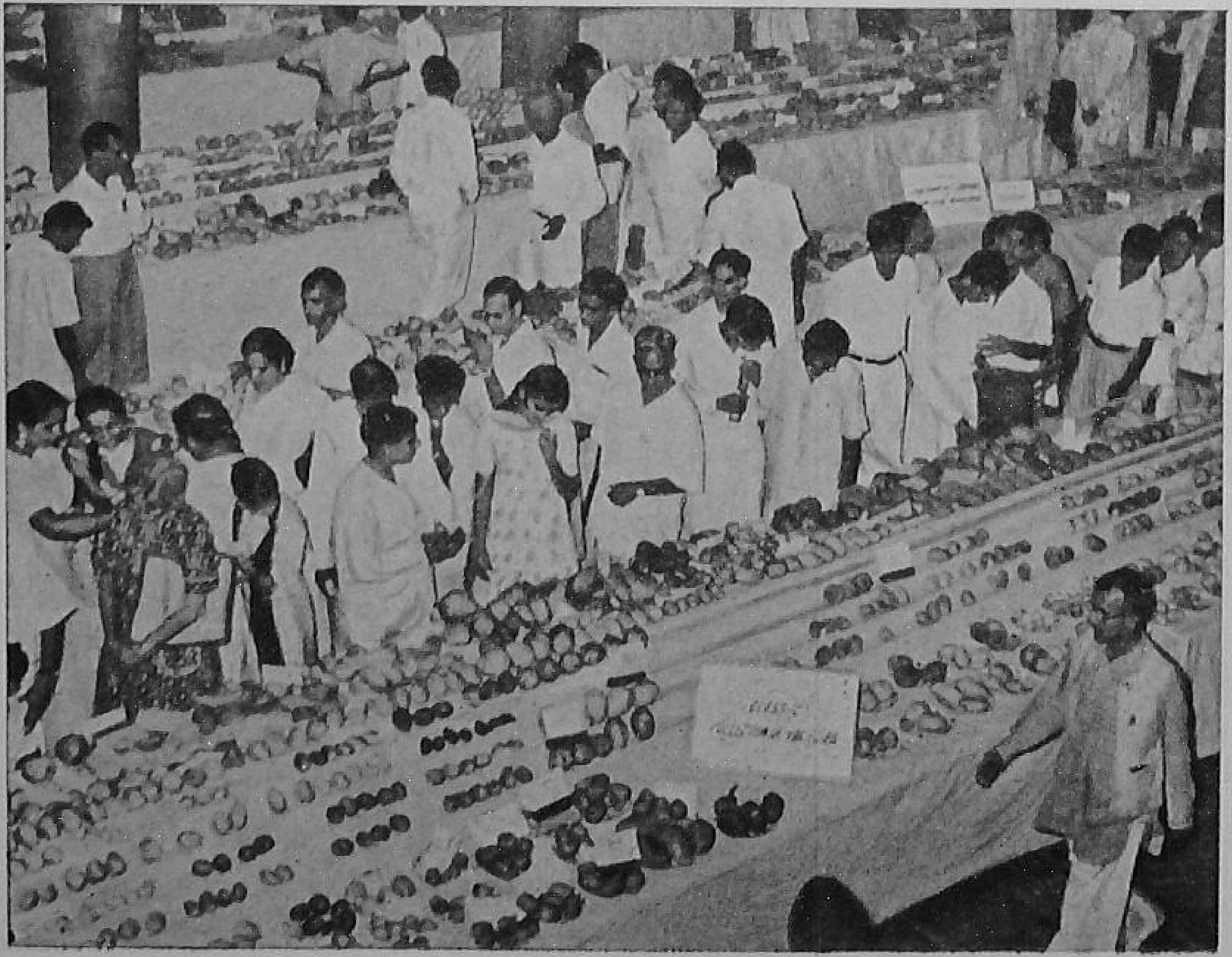
"Khas-ul-Khas" is the Best Mango

OVER 75,000 people visited the All-India Mango Show held in the Community Hall, Panchkuin Road, New Delhi, on 14th and 15th July, 1959. In all, 365 exhibitors participated in the Show and 180 prizes worth Rs. 6,000 were awarded. *Khas-ul-Khas* was adjudged the Best Fruit of the Show.

Picture on left shows Shri K. R. Damle, Secretary, Department of Agriculture, Union Ministry of Food and Agriculture, welcoming the Union Finance Minister Shri Morarji Desai, who distributed the prizes. On Shri Desai's right are seen Shri A. M. Thomas, Union Deputy Minister of Food and Dr. M. S. Randhawa, Vice-President of the Indian Council of Agricultural Research, which sponsored the Show.

Picture on right shows Mrs. Balbir Singh receiving the trophy for her highest aggregate score in the Home-Made Mango Products Section.

Delhi citizens turned up in large numbers to see the 575 mango varieties exhibited at the Show



News and Pictures

World Federation of Agricultural Producers

THE eleventh General Conference of the International Federation of Agricultural Producers will be held at New Delhi between November 27 and December 5, this year.

The agenda includes a review of current problems like harmonization of national price and income support policies, surplus utilization, expansion and stabilization of international commodity trade and a survey of the activities of inter-government agencies.

The IFAP has a membership of 28 countries and is the centre of consultation and action on social, economic and trade problems for primary producers throughout the world.

Dongargaon's Bumper Paddy Harvest

FARMERS of Dongargaon village of Durg district of Madhya Pradesh were rather sceptical about the Japanese method of paddy cultivation—until it gave them an extra yield of 700 maunds!

After much persuasion by agricultural experts, the villagers put 60 acres under the new method in the last *kharif* season. A medium variety of paddy was used as seed, with a seed-rate of 25 pounds per acre against the traditional 50 pounds. Seed-beds were laid out over ten acres; they were manured with ammonium sulphate and superphosphate. The seedlings sprouted quickly, and after 1½ months they were transplanted in lines.

The agricultural experts kept an eye on the various operations, for they were anxious that the experiment should succeed. To protect the tender seedlings from blast, they carried out prophylactic spraying. After a month, sporadic emergence of wild paddy was noticed. When the villagers began grumbling about this, it was pointed out to them that in fields under the Japanese method there was only one to ten per cent of wild paddy as compared to the usual 20 to 70 per cent.

The villagers harvested 1,800 maunds of paddy, which fetched them a net profit of Rs. 5,000. They had jointly spent Rs. 2,000 on manures, seed and labour.

They are putting their land under the Japanese method again this year.

—Shamsuddin

Australia's New Irrigation Scheme

ANOTHER large water-starved area of Australia is being opened up for closer settlement by a new system of irrigation canals. It is the Colembally Irrigation Area in New South Wales near the already successful Murrumbidgee Irrigation Area. The new scheme will irrigate 8,000 square miles of country for the production of fruits, vegetables and green crops, and for raising livestock.

Picture shows a harvester reaping the rice crops on the nearby Murrumbidgee Irrigation Area. Large capacity trailers, drawn by diesel tractors, are filled from the harvester's auger arm, as the harvester continues non-stop through the field. The trailers operate a shuttle service between the harvesters and bulk-load trucks waiting, off-field. Most of the rice is bulk handled but some is still bagged (as seen in the foreground).

farm flashes

A plastic coating, composed of chlorinated rubber, n-butyle stearate petrolatum and micro-crystalline wax when put on eggs reduces weight loss during warm weather and prevents changes in the alkalinity of the egg-whites. Untreated eggs lose as much weight in a week as the plastic-coated eggs lose in a month.

Restricting the feed of White Leghorn pullets during the rearing period to 70 per cent of normal consumption ups egg production by two to 36 per cent per bird housed. These results are based on the cost of feed consumed from hatch-date and on the value of eggs produced to 500 days of age.

Important factors in the higher returns for "restricted" birds appear to be slightly lower mortality and larger egg-size during the early laying period.

Dairy cows like their water often. They will take an average of ten drinks a day if they have free access to water in tanks or in pressure bowls.

This way they will produce four per cent more milk than when watered twice daily and six to 11 per cent more than when watered once daily.

By using milking cows for work, some decrease in milk yield as well as the butter-fat content does result, despite good feeding. However, the additional expenditure on feeding and the loss resulting from the decrease in milk yield are offset by the work output.

The cows tested were Red Sindhi and Hariana. Breeding, etc., are generally not affected, although some lengthening of the calving interval is noticed in the Hariana cows.

For successful control of areca thrips, spray the lower surface of the infested leaves with "Parathion" or "Malathion."

Betel-vine cultivation in arecanut gardens, using areca palms as standards, brings in an additional Rs. 500 to the farmer. This also results in clean cultivation and good drainage in the garden, as the vines respond only to very clean and intensive cultivation, which incidentally prevents diseases like *anabe* and *hidimundige* prevalent in other gardens where betel is not grown. The vines also protect the stem from sun-scorch.

By incorporating cane trash into the soil instead of burning it, the farmer gains in many ways: soil moisture is conserved and the soil texture improved. Weeds are smothered and the stem borer is kept in check.

The cane trash is collected in the interspaces between rows, and finally covered with soil during earthing.

Use the top portion of sugarcane for setts; it has the lowest total sugar content. Top setts also give higher germination because the young buds can germinate quicker, and due to the shorter internodes a larger number of buds are sown per unit length of row. A better stand of the crop is thus obtained.

Caked udders in high-producing cows may be due to shortage of protein in the ration in the period immediately before calving. The first milk after calving is high in protein. Therefore, a heavy milker may need more proteins than most rations provide.

Covering silage with a plastic sheet proved well worthwhile in an experiment. After a complete winter, the covered half of a stack was a foot higher than the uncovered half. The covered silage was also in fresh, moist condition compared with the water-logged, sour condition of the uncovered material.

Between the two monsoons, vegetables like ash gourd, cucumber, etc., can be cultivated in coconut gardens. In August, trenches are dug, filled with green leaves and farmyard manure and covered; seeds of vegetables are dibbled in the trenches. In September, when the plants sprout, weeds are removed, and earth and manure (farmyard manure, ash or prawn-dust) applied. Areca leaves may be spread on the ground for the ash gourd and cucumber to spread on.

Spray coconut palms in August-September with a mixture of a copper fungicide and DDT to check the leaf disease. Mix two ounces of "Cupravit" and three ounces of DDT and dissolve in five gallons of water. Repeating the spraying in December-January and March-April will arrest the spread of the leaf and root disease.

Co-operation Puts New Life Into Bulgarian Agriculture

by

Gursharan Singh

AGRICULTURE in Bulgaria has changed a lot since the country took to the co-operative system of farming. Old methods have yielded place to new, and better harvests are being reaped. Agricultural production has increased by about 20 per cent.

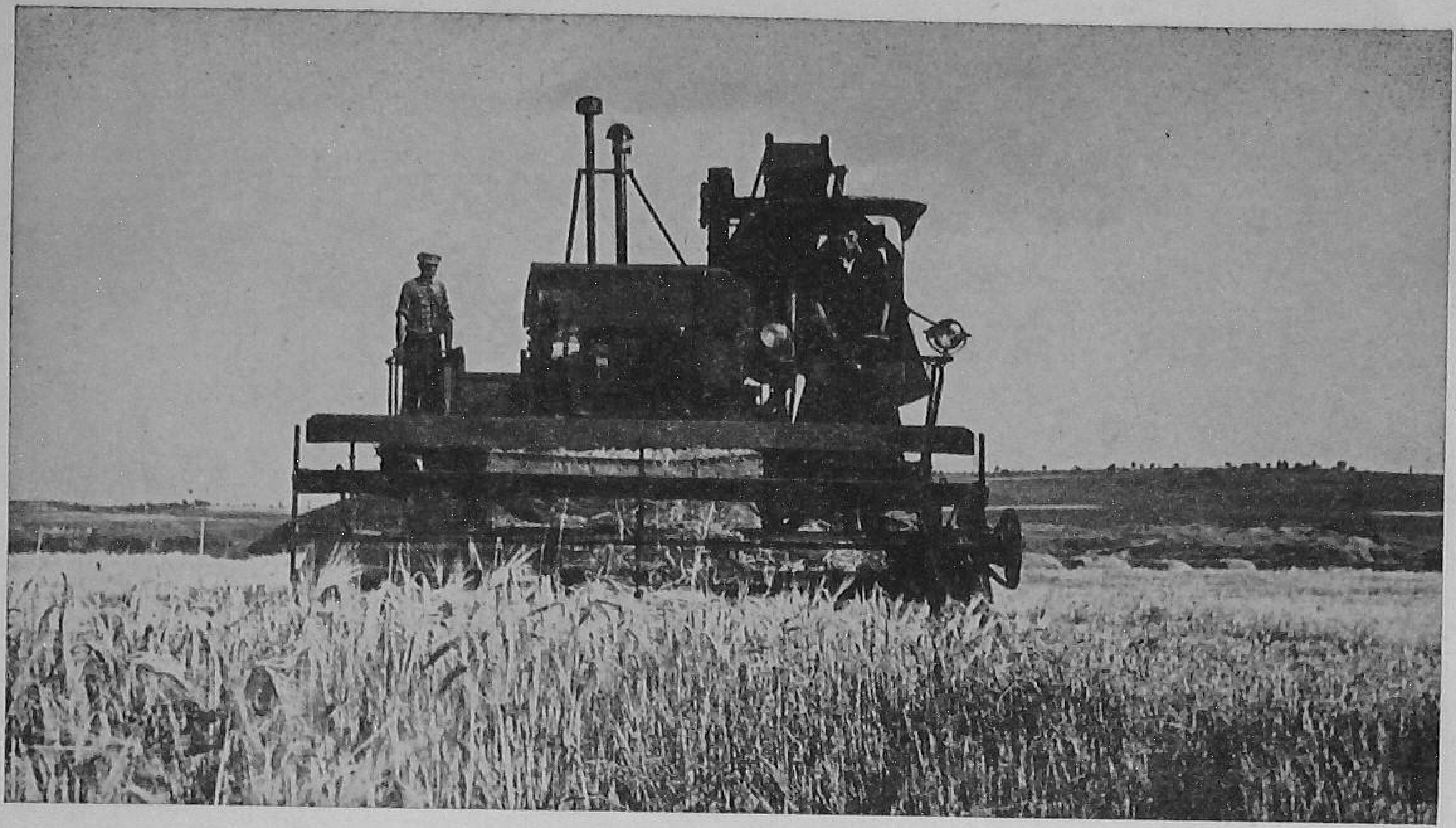
The following figures will give an idea of the yield-increases in individual crops compared with the pre-war period of the highest yield, i.e., 1934 to 1939.

Crop	*Annnual average per cent*		
	1934-39	*1949-1952*	*1953-1957*
Wheat	100	95.5	107.7
Maize	100	84.3	129.3
Sunflower	100	123·5	150.3
Cotton	100	181.8	290.9
Oriental tobacco	100	139.4	178.8
Sugarbeet	100	373.7	642.3
Tomatoes	100	361.9	700.0
Peppers	100	191.4	191.4
Potatoes	100	240.7	274.1
Apples	100	559.3	592.6
Grams	100	108.0	101.5

Much higher yields have been obtained in the last one and a half years.

Situated in the Balkan Peninsula, bordering Turkey, Greece, Yugoslavia and Rumania, Bulgaria has a total population of 7½ million and an area of 43,000 square miles. In 1946, Bulgaria passed an Agrarian Reform Bill restricting the maximum size of the individual holding to 50 acres in the case of arable land, with the condition that the land should be tilled by the owner

By consolidating farms under the co-operative system, it has been possible to use modern machinery to increase production. Here deep ploughing is being done with a tractor



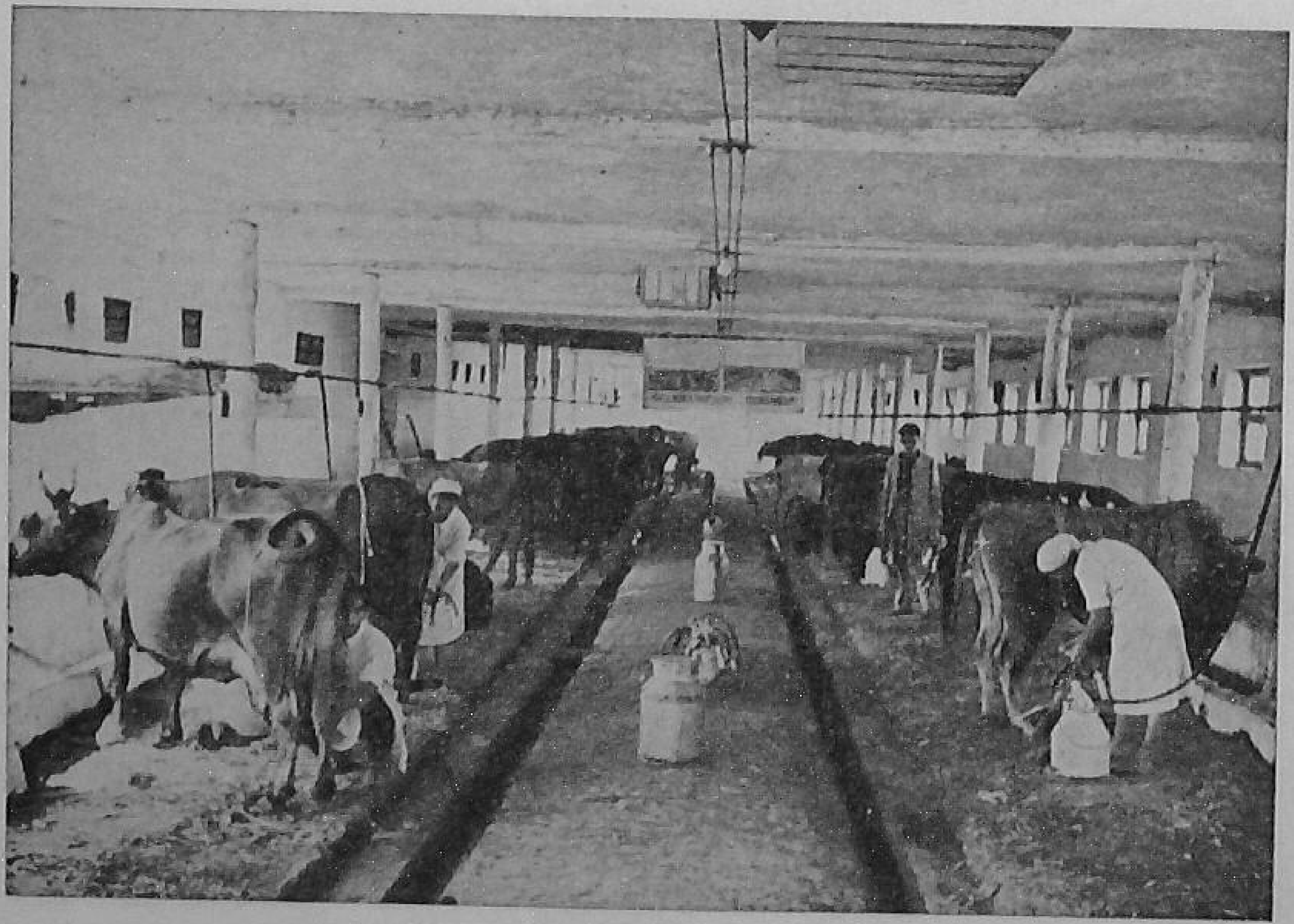
Harvesting with a combine

himself. As a result, 625,000 acres became available for redistribution among the landless peasants, 92 per cent of whom are today organized in co-operatives.

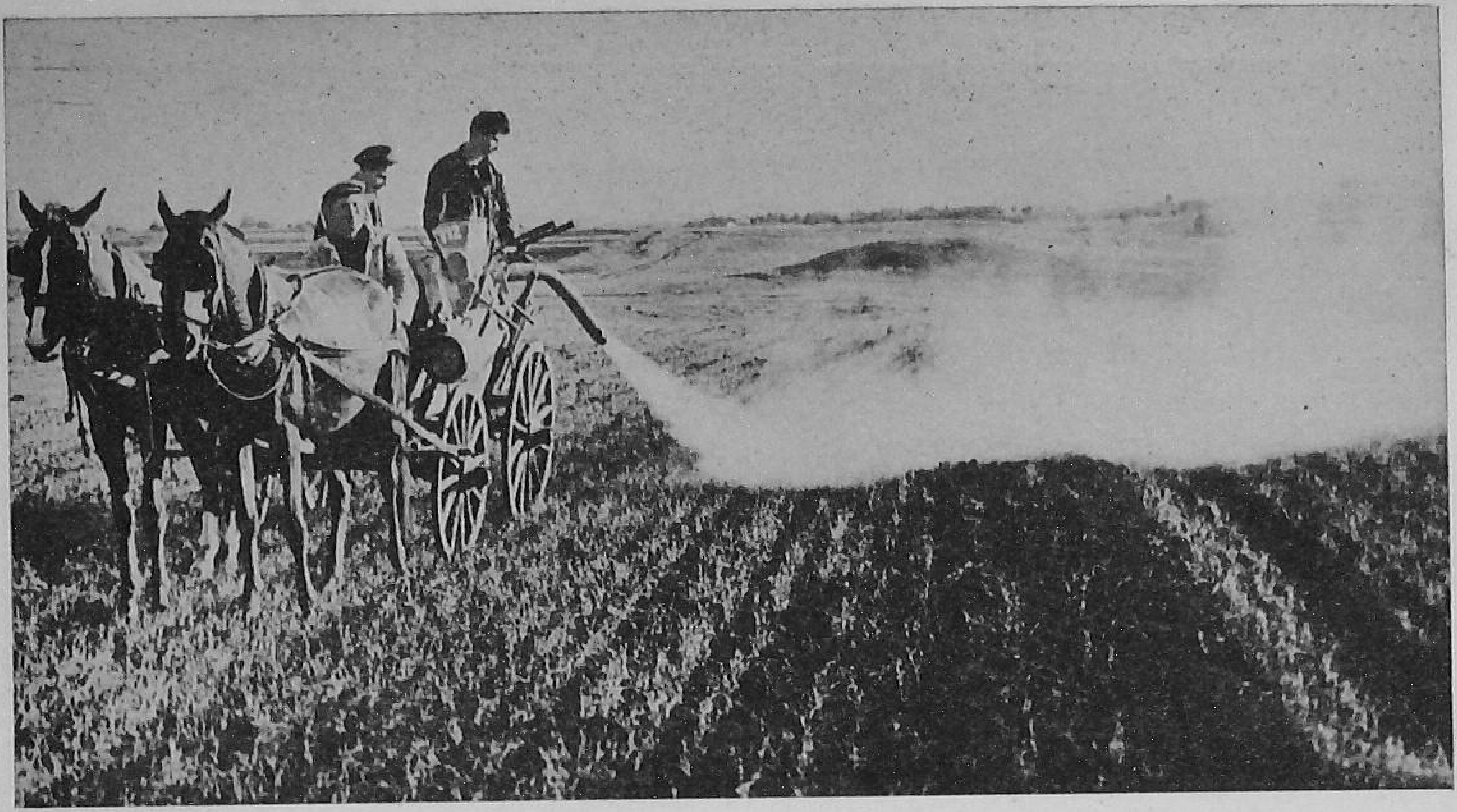
In 1944, there were 110 co-operative farms uniting 7,000 farmsteads and 66,000 acres of land. In 1946, the number of co-operative farms was 480, with 41,000 farmsteads and 431,500 acres of land. In 1950, their number rose to 2,501 with 502,000 farmsteads and 5,390,800 acres of land—more than half the arable land in the country. Today, there are 3,305 co-operative farms which own about 90 per cent of the total arable land.

BETTER FARMING METHODS

Co-operation in Bulgaria has brought about a large-scale consolidation of land holdings. As a result, it has been possible to make extensive use of modern



Co-operative farms use modern milking equipment



Spraying against pests and diseases is taken up in the early stages of the crop

machinery and better farming techniques, and thus raise the productivity of labour. Today, there are 38,000 tractors of 15 H.P. and 43,000 combine harvesters working on the co-operative farms, and their number is likely to increase during the country's third five-year plan.

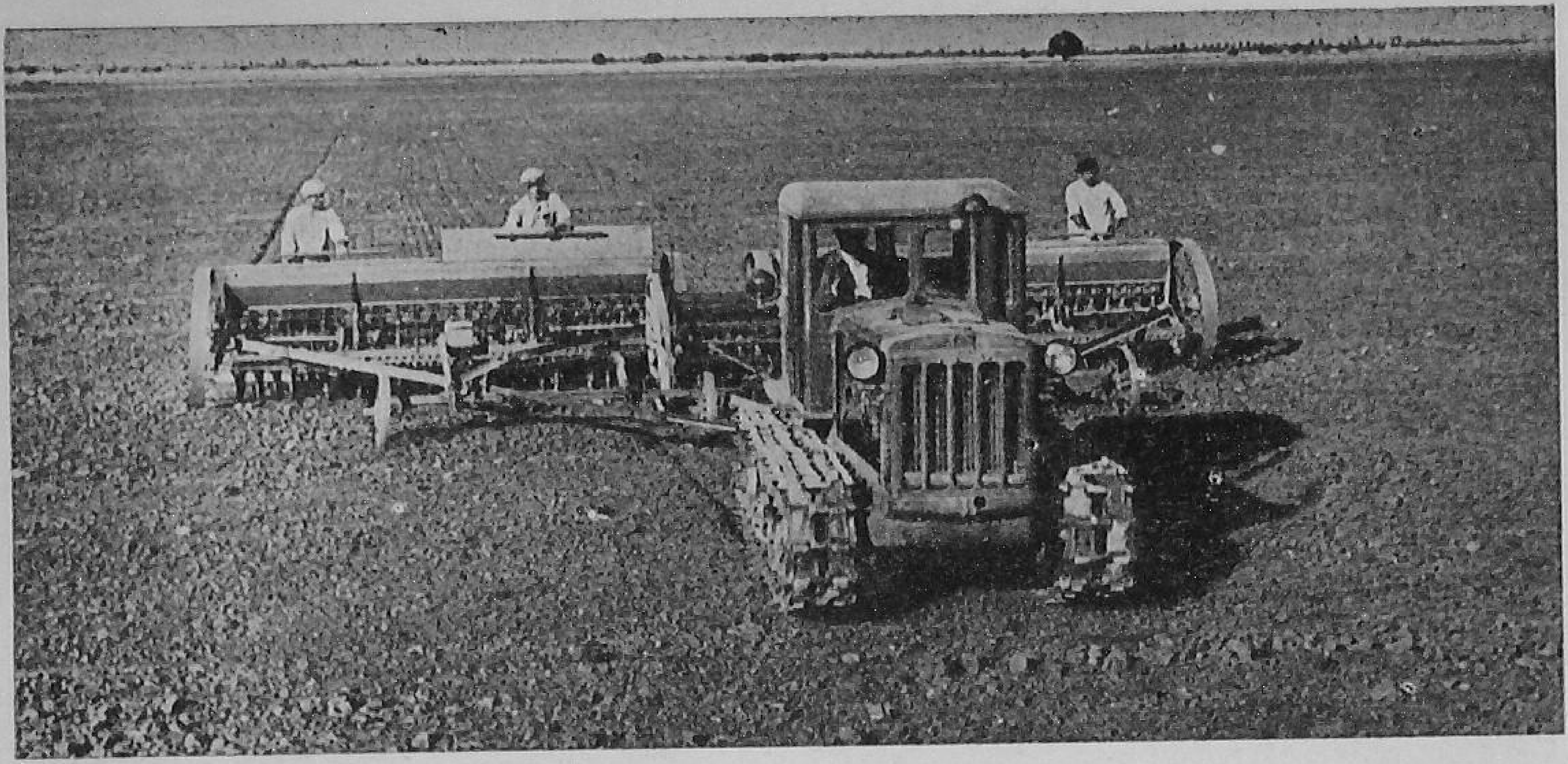
In Bulgaria, the land is owned by the individual peasants and all other means of production by the State. The income is distributed among the peasants according to the quality and quantity of the work done by them. The rent of the land is fixed by the General Assembly of the co-operators, but it does not exceed 25 per cent of the net income of the co-operative farm.

Every co-operator has also the right to own personal property in the form of three-fourths to 1¼ acres of arable land, one cow, five to eight sheep, one to two sows, up to 20 beehives and any number of poultry birds.

DEMOCRATIC BASIS

The co-operative farm is managed on a democratic basis. The main organs are the General Assembly of the co-operators, the Management Council and the Control Council, which function according to principles laid down. The first principle is that the members of the co-operative farm have the right to decide all questions relating to their farm. Any work-plan of the co-operative farm will depend entirely upon the decisions of the co-operators. All important problems are decided by the General Assembly. The second important principle is that all managing bodies of the co-operative farm are elected. The third is that the managing bodies must apply collective methods of work. Decisions are taken after discussion and in accordance with the majority opinion of the members of the managing bodies, the General Assembly, the Management Council and the Control Council. Co-operators have the right to demand reports from the elected managing bodies and to exercise control over their activities. All managers of co-operatives report their work to the co-operators.

A basic characteristic feature in the development of co-operative farms in Bulgaria is their completely voluntary nature. The peasants join the co-operative farms voluntarily if they are convinced of the advantages of the system. Moreover, every co-operator may leave the co-operative farm if he wishes ; in that case,



Sowing is in progress

he is restored the same quantity and quality of land which he had pooled in the co-operative, as well as the same agricultural inventory.

ALL-ROUND STATE AID

The State on its part renders all-round technical assistance to the co-operative farms. To supply the co-operative farms with selected seeds, pedigree animals, plants, etc., the State has established 49 enlarged State Farms as modern agricultural enterprises. These farms also serve as training centres as well as models for the co-operative farms. Until 1944, 784 villages were supplied with electricity, whereas today their number is 3,360. The radio sets, rarely seen in the villages before, today number 197,856. The number of libraries has risen from 2,344 in 1944 to 4,233 in 1956. There are 263 hospitals and medical aid is free.

In 1957, a law granting old-age pensions to the members of the co-operative farms—for men over 60 years and women over 55 years—was adopted by the National Assembly.

The arable land in Bulgaria is less than three acres per head of the village population. A movement for reclaiming millions of acres of waste, abandoned and eroded land has recently been started. The peasants are now turning this land into vineyards, orchards and raspberry gardens.

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EVERY farmer knows that the topsoil of his farm is his wealth. It is this topsoil, rich in plant foods, that bears his crops. If this topsoil is lost, everything is lost.

Yet, every year the farmer loses a part of this topsoil. It is a slow process and hence he is not aware of it. As the topsoil is lost, nature prepares new soil at the bottom, and makes up the loss.

But sometimes, as has happened in millions of acres of our farmland, the topsoil is lost so fast by erosion that nature cannot replace it at the same speed. Nature takes about 30 to 100 years to make one inch of the topsoil. But this one inch of the topsoil can be lost just in one to ten years due to neglect.

As the topsoil is lost, fertility is lost and what remains of the topsoil cannot support good crops. When the topsoil is gone, no crops can be grown. The farmer should take steps to stop this loss. The fertile topsoil is eroded or removed mostly by the action of wind and water.

Wind: Wind b'owing with speed blows off fine particles from the surface of your land. These fine particles are the ones that make the soil bear good crops. The coarser and infertile sand particles are thrown over fertile fields. As a result, such fields become less fertile and, in some cases, useless for growing crops.

Water: Raindrops beating with force on the soil wash away the fertile layer of the soil. When the soil is removed by water uniformly and in a thin layer from the entire area, it is called "sheet erosion."

If you do not do anything to check this sheet erosion, the water laden with silt runs along into small channels, spreading out like fingers over the field. This is "rill erosion."

If you still neglect to protect your soil, the many thin channels grow into wide and deep channels, called "gullies." "Gully erosion" is very dangerous. It not only eats away into your soil, but also divides the whole field into small pieces, making field work difficult and costly; the moisture from such a field is quickly lost. Crops fail.

Farmlands are more easily eroded than grasslands. Poor farm practices, lack of irrigation, uncertain rainfall and fragmented holdings help soil erosion on farmlands. In grasslands, overgrazing, burning and careless cutting of the grass help in erosion.

How to Control Erosion: In the dry farming areas (where the rainfall is scarce), put up contour bunds. Ask for expert advice from the Agricultural Officer of your area. Plough once in four to six years. Give only two harrowings and two interculturings instead of the usual four of each.

Follow contour lines in all your field operations, such as ploughing, harrowing and sowing. Sow thin, give wider spacing to your crops.

Follow strip-cropping by sowing *jowar* and *bajra* (which are the main crops and which allow erosion) with alternate rows of leguminous crops, such as pulses (which do not allow erosion).

Manure crops. In addition to giving farmyard manure, also apply other organic manures like oilcakes, and phosphatic fertilizers to your land. Ask your Agricultural Officer about the right doses and the right time to apply.

Follow good rotations. Alternate pulses and legumes with cereals and other grain crops. Grow strips of grasses with strips of crops along the contours, particularly in heavy black soils where bunds crack and give way. Some good grasses to select for growing are Blue Panic, Napier, Marvel and Para. When land is unfit for growing crops, as in some areas of Rajasthan, put it under permanent pastures or afforestations.

A land covered with vegetation does not easily get eroded. Trees, shrubs and grasses protect the soil well. Plant trees in forest land. To give them a chance to

grow, close the area to grazing for some time. Select trees which are most suited for growing in your area. Select more than one kind of tree, and plant at the optimum time. Contour-trench the area to conserve soil and water.

Steps to Prevent Erosion: Do not disturb the natural vegetation on steep and long slopes. If you clear them for cultivation, there will be severe erosion; springs will dry up; water reservoirs and farmlands down below will be silted. On very steep slopes, either grow trees or provide a cover of grasses. This will protect the soil. Do not clear such land for growing crops.

Do not plough up and down a slope, nor plant crops up and down the slope. Do not run your drainage channels down the hill. If you have to cultivate a slopy land plant your crops in strips at right angles to the slope. Follow all conservation practices in farmlands, which will keep as much moisture in the soil as possible.

In Forestland: When you cut a tree, cut it as near the ground as possible. This will lessen wastage and may give coppice shoots in the case of broad-leaved species.

Do not burn your pasture or woodlots. A fire will turn the soil dry. Do not lop trees which are less than a yard in girth. Lop bigger trees if you must, but not the leading shoots. Leave one-third of the crowns and lop the lower two-thirds.

In Grassland: Do not allow cattle to overgraze your pastures. If there is not enough of grass, stall-feed the cattle. Protect the grassland from fire.

In Fallow Land: Grow a leguminous crop. A land kept fallow easily gets eroded.

Never burn away the crop residues. Plough them all in. This will add more organic matter to the soil.

* * *

GRADING UP INDIA'S CATTLE

CATTLE bred from British stock are playing a major role in building up India's dairy industry along up-to-date lines. Herd improvement is being undertaken largely through artificial insemination from British herds. Cattle bred in this way would be restricted largely to the cooler hill areas, but by crossing, attempts will be made to produce cattle combining the producing qualities of British cattle with the heat and disease-resistant qualities of Indian cattle.

COMMUNITY AWARD FOR DELHI

THE Union Territory of Delhi has qualified for the Community Award of Rs. 50,000 by achieving an increased food production of over 15 per cent during the recent *Rabi* Campaign.

Final estimates for the 1958-59 *rabi* season show that the total production of *rabi* foodgrains (wheat, barley and gram) amounted to 21,000 tons—nearly 17 per cent more than the 18,000 tons average of the past three years. No small credit for this increase is due to the 32 teams of helpers who had worked in 200 Delhi villages, helping the farmers get agricultural credit, improved seed, fertilizers and equipment, and in adopting better farming methods.

The Delhi Administration distributed 9,200 maunds of wheat seed and 9,000 tons of fertilizers, besides distributing short-term loans amounting to Rs. 9.45 lakhs.

For the *kharif* campaign, it is proposed that the teams of helpers should devote special attention to personal contact with the farmers, to result demonstrations and discussions and method demonstrations. The teams have also been advised to suggest the most suitable time for taking up the rat eradication campaign, which is expected to cover double the area covered last year (35,000 acres).

INLAND FISHERIES RESEARCH

INDIA produces a little over a million tons of fish per year and ranks eighth among the fishing nations of the world. Production of fish from the inland waters of India is estimated to be one-third of the country's total production. Impressive as these figures appear, they can be greatly improved by scientific methods of fish production and proper exploitation of latent fishery resources. The Central Inland Fisheries Research Station at Barrackpore has been constantly working since its inception in 1947 to evolve methods to step up production from inland fisheries in India.

Among the schemes undertaken by the Station, one concerns the study of the fluctuation in availability of the fish population in the Hooghly; the object is to evolve suitable conservation measures. Experiments with river fish like Rohu, Catla, Mrigal and Calbasu have made it possible to make them breed in confined waters by injection of pituitary hormones. It has also been found that the pollution of fisheries by factory effluents can be greatly offset by measures like the dilution of the discharge and neutralization of toxic substances.

The inland fisheries research programme, which this Station has been executing in co-operation with the State Fisheries Departments, is proposed to be further expanded under the Third Five Year Plan.

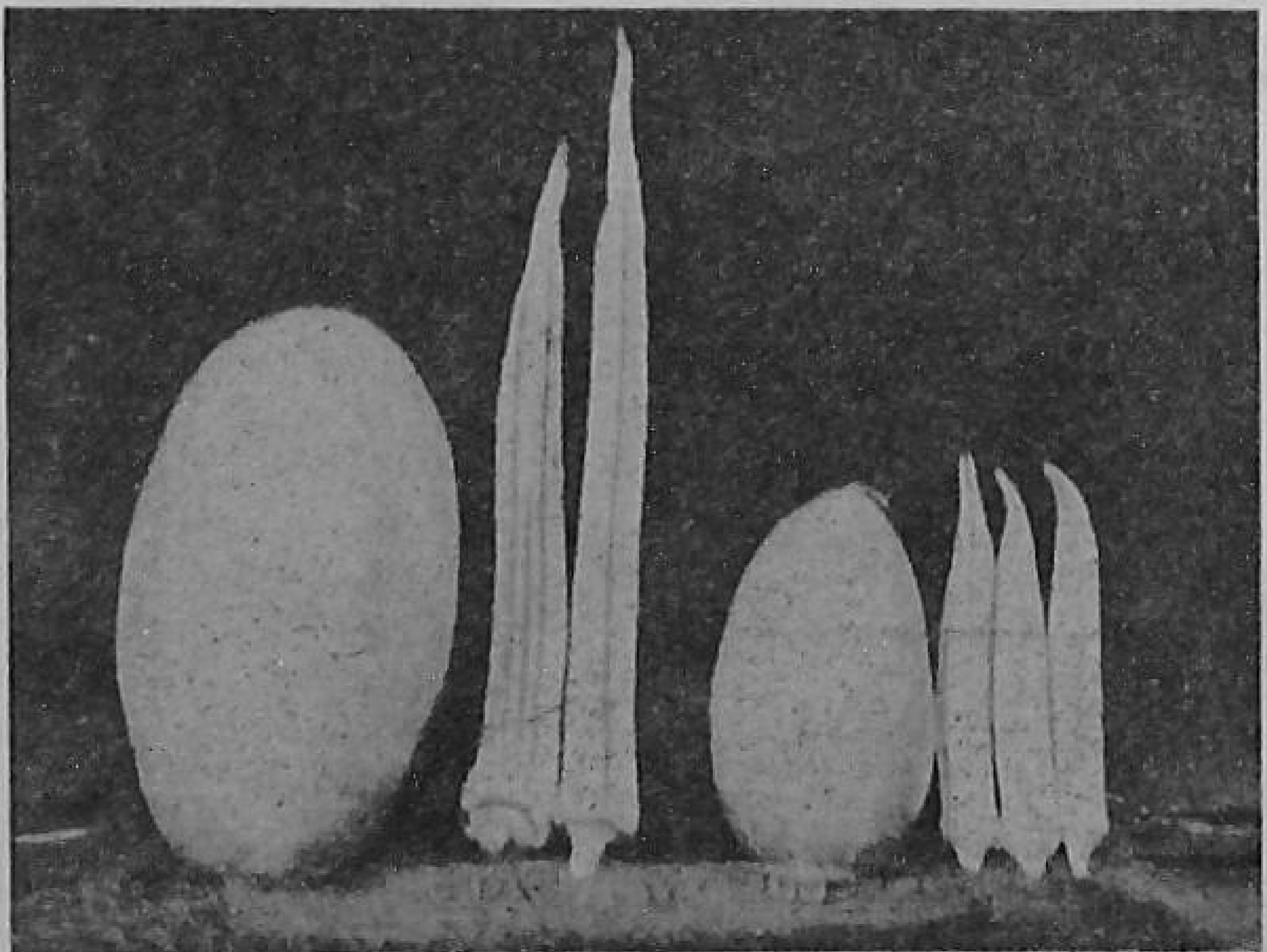
Hair Clippings Raise King-size Vegetables

A crop to be proud of

WHILE on a visit to a hair dresser's saloon in Kasaragod recently, I became a little curious when I saw a villager exchanging a bag of vegetables for a bag of hair clippings. On enquiring, I learnt that he was A. Kunhi from a nearby village, Adkathbail, in Cannanore district of Kerala State. When I was further told that he was using these hair clippings to manure his vegetables with excellent results, I immediately thought of visiting his farm.

Kunhi cultivates about five acres of land, which he has taken on lease. His cropping pattern is one crop of paddy and then two crops of vegetables. He is reckoned among the leading farmers of the locality, and is a Taluk prize-winner for his paddy crop.

The cucumber and *bhindis* on left are from plots manured with hair; those on right from plots treated with farmyard manure



When I visited his farm, Kunhi had already harvested his paddy, and vegetables had taken the field. I saw beds in which hair clippings had been used and

Kunhi's sons preparing a seed-bed by using hair clippings

also those to which a mixture of farmyard manure and ash had been applied. The vigorous stand of his *bhindi* and cucumber crops and the heavy fruits in the beds treated wtih hair did not leave any doubt in my mind about Kunhi's claim of reaping richer harvests from these plots.

At my request, Kunhi explained to me his precise technique of using hair clippings.

He ploughs the land twice and brings it to a fine tilth.

Then he makes ridges and furrows alternately, spacing them at four feet.

Before sowing the seed he spreads a three-inch layer of hair clippings, and covers them first with a half-inch layer of wood ash and then with a layer of soil.

When the plants grow to a height of about six inches, the clods in the ridges are crushed and the plots levelled.

No special treatment is given, except that regular watering and weeding are done.

—C.A. Thomas

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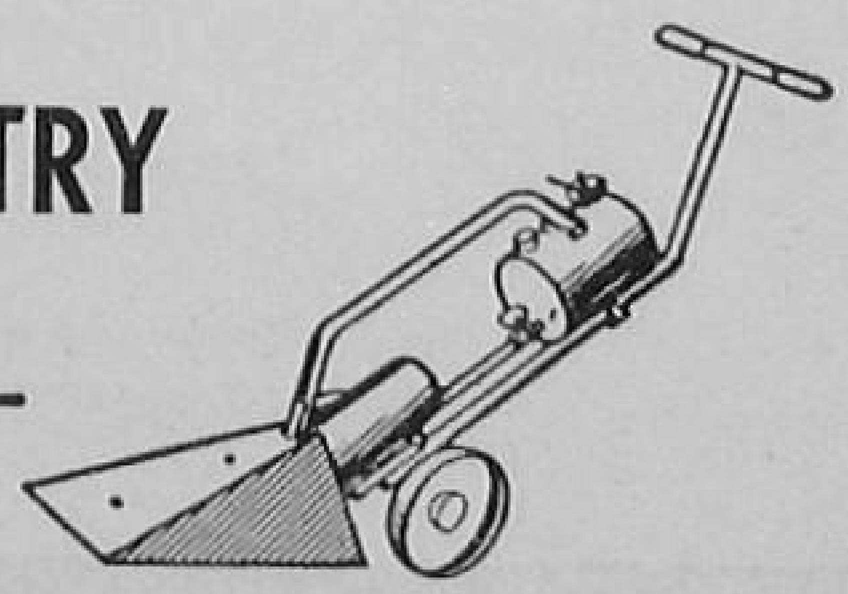

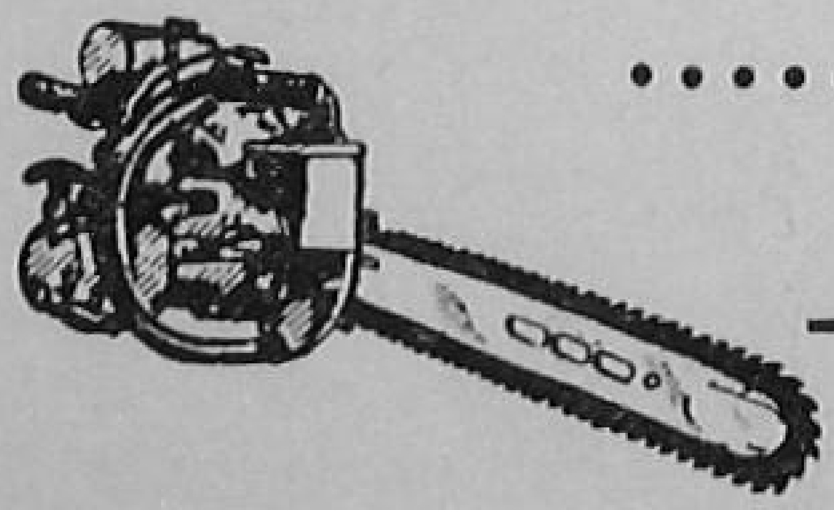

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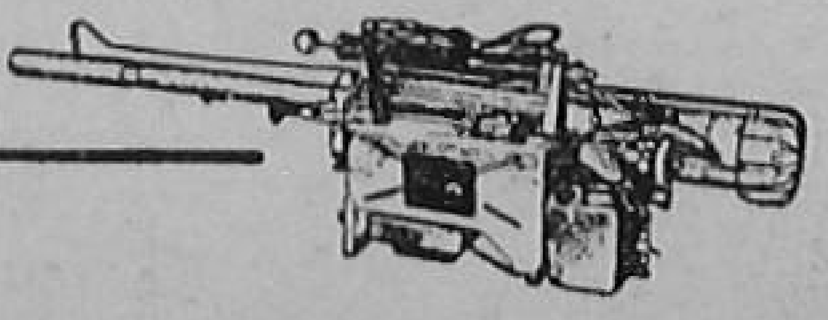

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Don't Spare The Egg

by
S. D'Souza

NOTHING like an egg or two in our daily diet for the normal upkeep of the body, say nutrition experts. Like milk, the egg also is a protective food because it contains all the necessary nutrients in a concentrated form.

Chemically, the egg can be divided into organic and inorganic matter. The organic substances are the proteins, lipids (fat-like substances), carbohydrates, vitamins and certain pigments ; the inorganic substances comprise mineral elements and water. All these are found in both the albumen and the yolk in varying proportions. The fuel value of an average egg is about 75 calories.

PROTEINS

The proteins of the egg are of the highest quality. The whole egg contains about 13 per cent of proteins. Half of these are found in the albumen, and the rest in the yolk and the shell and its membranes. The albumen consists mostly of simple proteins; the more complex ones are present in the yolk.

The various proteins of the egg are highly valuable in the diet of man. All the nine amino-acids essential for life are found in the egg. They are more easily assimilated than proteins found in meat or fish. About 98 per cent of the proteins in the egg are digested and utilized by the human body. Egg proteins are found to be superior to those of milk or wheat endosperm.

FATS

The fat of the egg, virtually all of which (99 per cent) is contained in the yolk, is present in a finely emulsified form. The egg fat, like milk fat, is easily assimilated, and ninety-six per cent of it is absorbed by our system. A part of it exists as phosphorized fat (phospho-lipid), like lecithin. True fats comprise 62 per cent of the total fat. Most of these fats have high energy value.

In its carbohydrate content, the egg is no better than any other food of animal origin. An average egg contains hardly 0.5 per cent of carbohydrates, practically all of them confined to the albumen.

VITAMINS

Except for vitamin C, the presence of which is questionable, all the vitamins required for the normal upkeep of the body are found in the egg. Most vitamin deficiencies have been got over by including one or two eggs in the patient's diet.

Most of the fat-soluble vitamins, i.e., A, D. E, and K are contained in the yolk which is a better source of vitamin A than any other natural food of animal origin except liver. The vitamin D content of the egg is also quite high. Yolk fed to children suffering from rickets cured them completely. Ordinary boiling does not affect the vitamin A and D potency of the egg materially.

Of the water-soluble vitamins, those generally termed as B-complex vitamins are found in the egg in fair amounts. The egg-yolk is much richer in these substances than milk.

MINERAL ELEMENTS

The egg is also a rich source of indispensable minerals, some of which are not found in other foods. About eight major elements and more than 20 minor elements are present in the egg. Some of them are: phosphorus, calcium, magnesium, chlorine, potassium, sodium, sulphur and iron.

The egg is a clean food and numerous tasty dishes can be prepared from it. Experiments have shown that the method of cooking the egg does not affect its total utilization: only, a fully cooked egg may take more time to digest than a half-cooked egg. Boiling causes negligible loss in its nutritional elements. Prepare them in any manner, eggs leave the stomach a little sooner than meat, without stimulating or irritating it much.

Bhandara Block Takes to the Japanese Method

by
S.K. Buzruk

ALTHOUGH the Paddy Pilot Scheme in the Bhandara Paddy Pilot Block, Bombay State, has been in operation since only last year 17,818 acres, have already been brought under the Japanese method as against the target of 20,000 acres. The method is not new to the cultivators of the tract, but it did not make much headway till the Pilot Scheme was launched.

This Paddy Pilot Block comprises the Sakoli and Tumsar Development Blocks, and covers 272 villages (Sakoli 133 and Tumsar 139). Of these, 27 villages are barren. It is estimated that 40,000 acres are under assured irrigation. The average annual rain fall in the district is 50 inches.

Propaganda was started by the staff of the Block in January, 1958. With a view to acquainting the field staff of other departments with the Scheme, the co-operation of the *patwaries*, Gram Sevaks, Gram Sahayaks and the primary school teachers was also enlisted.

Meetings of cultivators and cinema shows were arranged at important villages. More attention was paid to personal contact with the cultivators. The Village Leaders did appreciable work by actually helping the cultivators in field operations such as transplanting of paddy seedlings in lines. They also guided the cultivators in the proper application of fertilizers and intercultural operations. The Japanese method was explained to them in detail.

Also, demonstrations in nursery-raising, sowing, transplanting and interculture were arranged for the benefit of *patwaries*, Gram Sevaks, group secretaries and cultivators at Girola—a village which has adopted the method on 117 acres, though the area under irrigated paddy is only 104 acres. A similar demonstration, though on a small scale, was also arranged at village Pathri in the Tumsar Block. However, concentrated efforts could not be made in the Tumsar Development Block as compared to the Sakoli Block, because of frequent transfers of the Block Development Officers.

Three distinct communities of cultivators are met with here—the Kunabis (mostly in the Sakoli block), the Powars (mostly in the Tumsar Block) and the Kohalis (in both the Blocks). The Kunabis are quick to adopt improved methods of cultivation once they are convinced of their advantages. The Powars are most obstinate and always reluctant to take up new methods. Many of them are idle, though they own larger holdings than other cultivators. Moreover, the male has little voice in agriculture and the women-folk play a dominant role. Therefore, strenuous efforts were needed to induce them to take up the Japanese method. In a village named Chulhad, which has an assured irrigation on 1,300 acres, intensive efforts were made this year through house-to-house contacts. Some sort of awakening seems to have now taken place amongst the villagers and they are expected to take up the method over large areas.

Even from nature, many difficulties had to be faced till the actual transplantation of paddy seedlings. The rains were late during 1958-59 and the cultivators began to lose heart. Later on, however, there were good rains and the cultivators did not have to utilize the tank water. But immediately after the rains, there used to be intense heat, resulting in comparatively poor tillering of the crop. In the Sakoli Block, there were rains at the flowering stage, which affected the yield adversely.

The highest yields obtained were about 98 maunds per acre in the village Singpuri and about 78 maunds in Kotara.

One big benefit of the Scheme has been that close personal contacts have been established between the field staff and the cultivators of the area, which augurs well for our future programmes.

How Veterinary Activities Differ

IN

LESS AND BETTER DEVELOPED

COUNTRIES

by
Sir Thomas Dalling
Consultant of the FAO
Rome

THE present systems of education for veterinarians throughout the world have much in common and are designed to provide the essentials of training to enable graduates to undertake duties in different parts of the world. It has to be remembered, however, that the actual work required from veterinarians differs according to prevailing conditions in their spheres of activity.

In countries in which veterinary services have been long established, the work and duties of veterinarians have become, at least to some extent, regulated by public demand and by the economic and sentimental value attached to animals of all species. In such countries, which may be referred to as better developed countries, livestock is usually more concentrated in relatively small areas and the number of veterinarians in them is relatively large. On the other hand, in countries in which the animal population is more scattered, extending over wide areas and in which less value is attached to individual animals, there is usually a much smaller number of veterinarians and their work, in detail, often differs considerably from that carried out in better developed countries.

PRIVATE PRACTICE

One of the main differences between such areas is private veterinary practice. Although state veterinary services are essential for the control of animal diseases, especially contagious diseases, in all parts of the world and are found, in some measure, in all countries, private practice is found only to a limited extent in the less developed countries.

Generally speaking, the work of private practitioners is concerned to a large extent with individual animals or small groups of animals, whereas a state veterinary service deals more with a country as a whole in the application of regulations and extensive schemes to control and prevent the spread of a disease and to ensure that some diseases do not enter the country. In some countries, the state veterinary service, in addition to its own veterinarians, makes use of private practitioners in a part-time capacity to assist in its activities; and, especially in less developed parts of the world, the staff may include personnel trained and experienced in some aspects of the work which is carried out under supervision of the veterinarians.

In the course of time and as conditions have changed in most countries, the work in private practice has also undergone change. With the introduction of mechanical methods in agriculture and transport work in many parts of the world, the need for horses is rapidly disappearing, with the result that the mainstay of private practice of some years ago has moved to other animals. The importance now attached to cattle, pigs, sheep, goats and poultry has meant that their owners have become more concerned with the health problems of such animals: in such work, veterinarians have been much assisted by the results of research work throughout the world.

DOMESTIC PETS

Again, the interest now being taken in domestic pets, especially dogs and cats, has created a demand for veterinary services to such an extent that many veterinarians now devote their whole time to the care of such animals. Knowledge and information on the health and disease problems of these animals have increased very rapidly in the past two or three decades: the advent of women into the veterinary profession coincided to some extent with the expansion of veterinary activities relating to small animals. In most of the larger towns, especially in better developed countries, clinics devoted entirely to small animal veterinary work are to be found. Rapid progress has been made in the surgery of these animals, and in such clinics well-equipped operating rooms are usually available where care very similar to that given to human beings is exercised in dealing with them.

Surgical work on the larger domestic animals has also advanced to a marked extent in recent years. Veterinarians now undertake surgical operations which, at one time, would have been considered impossible or attended with much risk. Much of the risk has been overcome by the development of more satisfactory techniques of anaesthesia.

A considerable amount of the time of a veterinarian in private practice must be spent on the farm itself. Until modern transport became available, much of the veterinarian's time was spent in travelling from farm to farm. Today, by the use of motor vehicles and even aircraft, longer distances are covered in a short space of time and, therefore, the activities of veterinarians in private practice have substantially increased in most areas.

Whereas in former times it was uncommon to find more than one veterinarian in a practice, the tendency today is to have a number, co-operating as partners or acting as assistants, in a single practice. This system has many advantages.

PART-TIME WORK

Veterinarians in private practice may be appointed for part-time work for a state veterinary service. This may occupy a considerable amount of their time each day, especially in countries where extensive schemes for the eradication of a disease are in progress. On the other hand, in some parts of the world, practically every veterinarian is an employee of the state veterinary service, but is permitted also to engage in private practice when it does not interfere with his state duties.

Apart from private practice, veterinarians in the more developed countries are employed on a full-time basis for other duties. Control of *abattoirs* (public slaughter-houses) falls into this category. Such appointments may be made by a Government when control of *abattoirs* is a function of the state. In other cases, local authorities and municipalities are responsible for *abattoirs* and appoint the necessary veterinary staff. In some parts of the world, all livestock for slaughter and the operating of *abattoirs* and packing plants are carried out entirely by private enterprise. Veterinarians are employed by such companies, usually in a full-time capacity. They may be in actual charge of the different operations or may act as supervisors and advisers. In addition, veterinarians employed by the state also participate in the work.

STATE LABORATORIES

In more developed countries, veterinarians in private practice are assisted, especially in the diagnosis of disease, by laboratories supported by the state. This type of service has received considerable prominence within recent years and is now regarded as an essential adjunct to the control of animal health and disease. In most countries, there is at least one such laboratory: in others, in addition to a central laboratory where both diagnosis and research work are carried out, there exist smaller laboratories located in different areas and equipped and staffed to ensure adequate provision for diagnosis work and for simpler types of research on the more local types of problems. Any problem which requires more facilities than those available at such local laboratories is referred to the central laboratory where extensive research work can be carried out.

This system of local investigation of disease problems is proving to be of high value: co-operation between the veterinarians in private practice and the local veterinary investigators is revealing problems of animal health and disease the solution of which is of considerable economic importance to a country. These local veterinary investigators acquire a large amount of information on animal health problems and often, from their work, a problem affecting a whole country or area is solved.

More interest is being taken in the health of wild animals in captivity, and it is now a normal procedure to appoint veterinarians to zoological gardens to advise on feeding problems, control of disease and the general conditions under which such animals are maintained.

BIOLOGICAL PRODUCTS

Mention must also be made of the excellent work carried out in a number of countries by veterinarians employed by private or commercial companies for the production of biological and chemical and other

products which are now in everyday use in the prevention and control of animal diseases. At such establishments, extensive research work is also carried out and the world, in general, owes much of its knowledge concerning the maintenance of health and disease control to the activities of the veterinary staff there.

In some parts of the world where animals are kept under ranch conditions, veterinarians in private practice give veterinary attention on an extensive scale. Such work embraces the adoption of measures to prevent diseases which are prevalent in the district: vaccines and other biological products are used at the appropriate times and the veterinarians often have to spend quite long periods on the ranches to carry out various operations.

In less developed countries, animal health problems are largely the concern of the state veterinary services which are developed and enlarged as the work develops. The essential need for veterinary services is recognized in all these countries and their extension is often limited only by the number of veterinarians available. It can be appreciated that there is a desire to employ veterinarians trained in the country itself or in the area. This has not always been possible and it has been necessary to appoint veterinarians trained in better developed countries as personnel of the state veterinary services. This has had its advantages, for it has meant that solid foundations have been laid by well-trained veterinarians and on such foundations it has been possible to build up services which, following expansion, are proving their worth in world economy.

LOCAL TRAINING

As time goes on, more facilities are being provided for the local education and training of veterinarians in less developed countries of the world. This, together with the expected improvement in conditions for locally trained veterinarians, will encourage more young people to graduate as veterinarians and will obviate the need to send students from such countries to veterinary schools in the better developed parts of the world for training.

It can be well appreciated that, in these areas, because of the large numbers of livestock scattered over wide areas and the conditions under which they are maintained, not all the work on animal health and disease control can be carried out by veterinarians. This has resulted in the employment of lay staff who have undergone some training along special lines, working under the supervision of veterinarians. These men are indispensable today and the value of the duties they carry out is reflected in the progress now being made in the improvement of animal health in many parts of the world.

TEAMWORK

The work of a state veterinary service in less developed countries must be essentially concerned, in the first place, with the control and prevention of contagious and infectious diseases. Generally speaking, the individual animal is of little consequence: the object of the veterinary activities is to free groups of animals from disease, and to prevent the occurrence of disease in a locality.

Thus, large numbers of animals are treated at one time and at appropriate periods and places. Teamwork is the keynote in such areas. Naturally, the recognized and prevalent diseases are now given, and will continue to be given, priority in the work of such veterinary services. It is highly encouraging to note the progress, sometimes rapid, that is being made in the control and eradication of some of the diseases which, at one time, were prevalent in such areas.

Attention is always being given to diseases which have been recently introduced or which may have been unnoticed in the past. In this work, veterinarians are greatly assisted by the observations carried out in other parts of the world and by the results of work from diagnosis and research laboratories in the area and elsewhere. Despite the precautions taken, the introduction into an area of new diseases from outside the area sometimes occurs: the early recognition of the infectious agents is essential, so that recognized control measures may be brought into force.

ANIMAL HUSBANDRY

There has always been much discussion about the part which veterinarians should play in animal husbandry and nutrition of livestock. Although it may be claimed that animal disease control is a subject apart, there is undoubtedly a close link between them. This is marked in the maintenance and improvement of animal health, especially in less developed areas of the world, and necessitates a good knowledge of animal husbandry by veterinarians in such localities.

This knowledge has to be acquired during the training period as well as by experience. Animal husbandry in all its aspects must be one of the important subjects dealt with at veterinary schools in these parts of the world, where livestock owners largely depend on the discussions with and advice received from veterinarians. It often happens that veterinarians in the course of their travels in these areas are consulted on many problems pertaining not only to animals but also to human

beings, and it is of interest to record that in at least one veterinary school a short course in human medicine is included in the veterinary course.

As animal production is being improved in less developed countries, the importation of valuable breeding animals is taking place. While these animals have undergone examination before export and have been found free from infectious diseases, their further examination on arrival is necessary to minimize any risk of the introduction of any specific infectious condition. Such valuable animals must also receive careful veterinary attention to prevent their acquiring any local disease to which they may be susceptible and given immediate treatment, should any such infectious condition be diagnosed in them. Thus, although in general, individual animals in less developed countries do not normally receive much attention, exceptions are made with imported stock.

While the bulk of the veterinary work in these areas is carried out by state veterinary services, veterinarians in private practice are also found, especially in the larger towns. As a country becomes developed and herds and flocks of good quality animals are established, the demands for the services of veterinarians in private practice increase. There is also considerable scope for such veterinarians in race-horse work and in attending to the health and diseases of domestic pets, e.g., dogs and cats.

Diseases, probably less spectacular than those normally found in these less developed areas, are gradually receiving attention and will be better controlled as more veterinarians become available.

One of the objectives in improving animal production in less developed areas of the world is to set up an export trade in livestock and animal products. In some countries, a beginning has already been made in this work and *abattoirs* under the control of veterinarians are available for dealing with a considerable number of animals. Economically, the health of livestock will play a considerable part in the success of such operations. Control and eradication of the already recognized diseases, research work carried out by governments or by private enterprise on the causes and control of hitherto unrecognized diseases and the provision of necessary biological products and medicaments, are all essential parts of such schemes. It is encouraging to note that these subjects are recognized and that action is now being taken in some areas to develop all this work as far as circumstances will allow.

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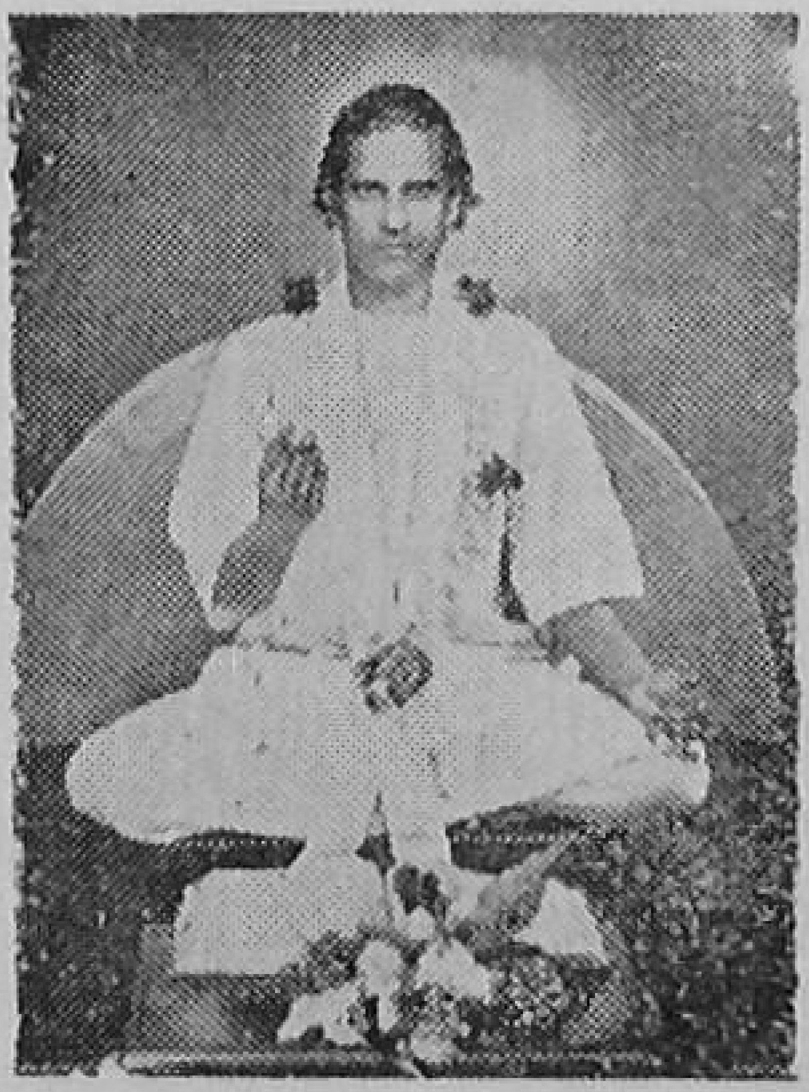

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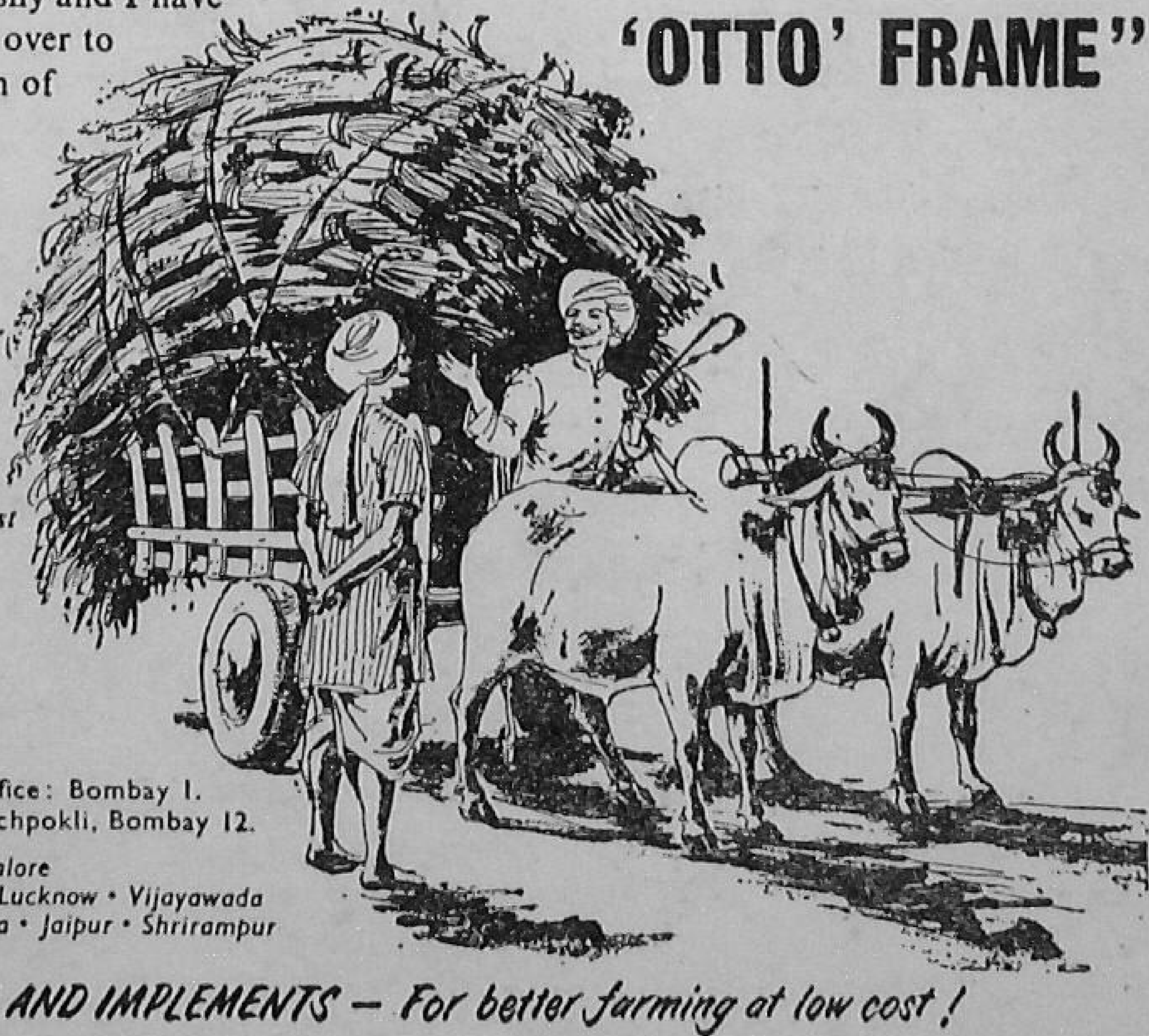

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EVEREST

The Red-stemmed Lemongrass Comes to Kumta

by

V. G. Kulkarni

EXPERIMENTAL cultivation of the red-stemmed lemongrass at Kumta in North Kanara district of Mysore State has shown that the variety suits the area well. Oil extracted from the grass has been found to fulfil almost all the requirements of the Indian Standards Specifications, some of which are: a reddish yellow to brown colour, lemon-like odour, an average specific gravity of 0·900 at 27°C and an average citral content of 78 per cent. Its cultivation on a small scale is, therefore, now being encouraged here.

North Kanara forms a narrow strip of land on the West Coast of India. The rainfall in the coastal tract is about 150 inches. The soil is typically laterite and the climate hot and humid. The white-stemmed variety of lemongrass is found at Ankola, Kumta, Honaver and other places. It puts on a luxuriant growth in the rainy season. Grass collected nearabout Kumta has given an average oil-yield of 0·8 per cent on the fresh weight. All over the north of Mysore State, this variety is used as an antidote for cold and cough, but it is not used for oil extraction.

In Kerala State, where the soil is typically laterite, both the white-stemmed and red-stemmed varieties are found. The latter is found wild as well as cultivated in the northern parts of Kerala as also the southern parts of Madras State.

The seeds of the red-stemmed lemongrass were obtained from the Lemongrass Research Station, Odakali (Kerala State). They were sown in raised beds, which were well manured. Sprouts appeared within six days or so. The seedlings were transplanted after 60 days. They put on a vigorous growth and were harvested 60 days after they were transplanted, when the leaves were three to five feet long. The leaves were cut with a sickle, leaving four to six inches of the stem. After every 1½ to two months, fresh cuttings could be taken.

There was practically no rainfall after October. The irrigated plots could be harvested at regular intervals even up to April. Plots that were not irrigated gave their last crops in January, after which the plants were dormant. In the first year, the yield of grass for five *gunthas* (⅛ acre) was 1,020 pounds and of oil, 50 ounces.

DOUBLE YIELD

With the onset of the monsoon the next year, the plants again sprouted, exhibiting luxuriant growth. The stems had become quite thick and every seedling had formed a huge clump, which was broken up and replanted, leaving a sufficient distance between two plants. The yield in the second year was almost double that in the previous year, i.e., 1,990 pounds of grass and 90 ounces of oil.

The oil was extracted from the leaves by the water-distillation method. A boiler with a false bottom (2 feet × 3 feet) fitted with a funnel-shaped cooler (one foot × 2·5 feet) was used, which could take in a charge of about 100 pounds of grass at a time. The mixture of oil and water was run into a small Florentine flask, from which the clear oil was taken out through the outlet at the top. Distillation took three hours.

At Kumta, the yield of oil on the weight of fresh grass was about 0·2 to 0·3 per cent during the rainy season and between 0·4 and 0·5 per cent during summer, compared to an average 0·3 per cent in Kerala State. The citral content, as analysed at the Karnatak University Chemistry Research Laboratory, was 70 to 85 per cent.

CONTD. FROM PAGE 14

Karnal Substation

farming, the heavy duty disc is a better implement for inversion than the furrow-turning plough. Harrowing and grubbing are complementary operations, as neither of them by itself suffices to prepare the land. Over disc harrowing spoils the structure of the land. In alluvial soils with sandy loam to loam texture, provided the land is worked at the optimum moisture level, the constant use of the furrow-turning plough and other tractor-drawn implements do not conduce to plough-pan formation. The optimum size of holding for tractor cultivation varies with the size of the tractor. For 150 per cent intensity of cropping, the holding sizes recommended are as follows.

Tractor specification	*Holding size*	*Plot size*
15 to 20 H.P.	50 acres	2.5 acres
25 to 30 H.P.	100 acres	5.0 acres
30 to 45 H.P.	250 acres	7.5 acres

While for dry land cultivation, wheeled type tractors are more suitable, for wet paddy land cultivation "Caterpillar" tractors give better service.

Disc harrows can also be used for threshing of wheat, oats, barley and gram. The output depends upon the size of the tractor and the capacity of the disc.

Tractors can be economically employed for road work, grinding of corn, chaffing of fodder, lifting of water and for operating the ensilage cutter and threshers. Threshing of oats, wheat and paddy can thus be done at very low cost. These operations cut on the idle time of tractors and, therefore, reduce their working cost.

The Substation's research activities have recently been reorientated with the shifting of the National Dairy Research Institute from Bangalore to its new home at Karnal. Agronomic research on various field and vegetable crops has been intensified. A project for breeding wheat for smut and bunt resistance has been initiated. Research on the pathology of red rot and wilt of sugarcane has been extended. Investigations on epidemics of cotton pests have been started. Co-ordinated projects on fertilizers and soil fertility with the Soil Science and Agricultural Chemistry Division of the I.A.R.I. and on improved varieties of crops with the Botany Division, have been set up. A new laboratory is soon to be established at the new site of the Substation for coordinated research on management of soil, irrigation and crops of the region.

CONTD. FROM PAGE 16

I.A.R.I. Float

During the final surface preparation of land, the float should be worked in both directions, i.e., length-wise as well as breadth-wise. Where levels are very poor, the operation may be repeated. The finishing operation should be in the direction of irrigation.

In another trial, observations were taken with a dumpy level to measure the smoothening in a field where grooves had been formed by ploughing with a "Victory" plough and preliminary planking with the *sohaga* had failed to restore the level. The results of the trial are given below.

Levels observed before use of float R.L.	*Levels observed after use of float R.L.*	*Difference in levels before use of float*	*Difference in levels after use of float*	*Distance from roadside end of the field*
		(In feet)		
730.45	730.57	0.28	0.00	20.0
730.73	730.57			20.51
730.37	730.48	0.26	0.01	60.0
730.49	730.63			60.5
730.47	730.64	0.29	0.00	80.0
730.76	730.64			80.5
730.49	730.60	0.28	0.02	100.0
730.77	730.58			100.5
730.68	731.71	0.71	0.00	130.0
730.85	731.71			120.5
730.56	730.80	0.44	0.00	140.0
731.00	730.80			140.5

It is noteworthy that the implement smoothened the surface within two-hundredths of a foot.

The dimensions of the float can be varied to suit the number of bullocks available for the job. The I.A.R.I. model, however, works best when two pairs of bullocks are hitched (although the draft is well within the capacity of a single pair), the main reason being that then the alignment of the float is under perfect control. With a single pair, there is a tendency to crab and fish-tail from side to side. However, work is also in progress to design a float which can be drawn by a single pair of bullocks.

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